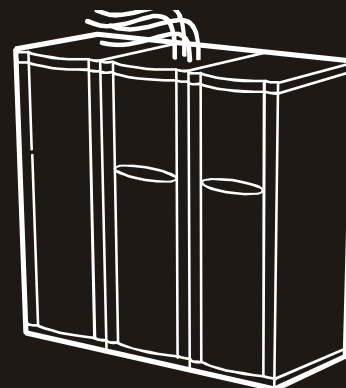




Installation and Start-Up

80kW InfraStruXure™ System

Medium Data Centers
208/480/600V Input



About this Manual

This manual is intended for APC Field Service Engineers or APC-trained installers of a 80kW InfraStruXure system. It covers basic installation and start-up.

For additional information about installing the InfraStruXure system, see *Certified Electrician's Instructions* (990-1469A), which provides specific instructions for the electrician connecting utility to the InfraStruXure PDU.

For information about installing specific components in your InfraStruXure system, see the documentation included with each component. Before installing or operating any component, refer to the safety instructions in the component's manual.

The illustrations of products in this manual may vary slightly from the products in your InfraStruXure system.



Note

You can check for updates to this manual by clicking on the **User Manuals** link on the **Support** page of the APC Web site (www.apc.com). In the list of InfraStruXure manuals, look for the latest letter revision (A, B, etc.) of the part number on this manual.

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Safety

Overview

Save these instructions

This manual contains important instructions that must be followed during installation, operation, and maintenance of the InfraStruXure System.

Safety symbols used in this manual



Indicates an electrical hazard, which, if not avoided, could result in injury or death.



Indicates a hazard, which, if not avoided, could result in personal injury or damage to product or other property.



Indicates a potential hazard which could result in damage to product or other property.



Indicates important information.



Indicates a heavy load that should not be lifted without assistance.



Indicates a standby state. When in standby, the unit is not operating, but it may still contain hazardous voltage. It is not safe to service until the equipment is disconnected from all sources of electrical power.

Cross-reference symbols used in this manual



Indicates that more information is available on the same subject in a different manual.



Indicates that more information is available on the same subject in a different section of this manual.

Warnings

Installation/Maintenance

Only a certified electrician can perform these tasks:

- Connect the PDU to utility
- Connect the cross tie output breaker to another PDU
- Connect a switch to the EPO interface on the PDU

Only a certified electrician or an APC Field Service Engineer can perform these tasks:

- Connect the PDU to the Symmetra PX UPS
- Perform maintenance of the PDU

When you connect the PDU to utility, you must install a circuit breaker to protect the PDU against over- current. Determine the type of circuit breaker that you need to install:

Input Voltage	Circuit Breaker Sizing
208 V	350 A
480 V	150 A
600 V	125 A

Maintenance performed while the PDU is receiving input power

APC does not recommend that you perform maintenance of the PDU while it is receiving input power. However, due to the critical nature of data center loads, this may occur. If you must perform maintenance while the PDU is receiving input power, observe the following precautions to reduce the risk of electric shock:

1. Never work alone.
2. Perform the maintenance only if you are a certified electrician who is trained in the hazards of live electrical installation.
3. Know the procedure for disconnecting electricity to the PDU and the data center in case of an emergency.
4. Wear appropriate personal protective equipment.
5. Use double-insulated tools.
6. Always follow local and site regulations when working on the PDU.

Total Power Off

1. Set the Symmetra PX UPS **System Enable** switch to Off.
2. Set the **DC Disconnect** breaker of each Battery Enclosure to Off.
3. Set the PDU **Main Input (A)** switch to Off.
4. If applicable, set the PDU **Bypass Input (B)** switch to Off.
5. If applicable, set the PDU **Cross Tie Output (X)** circuit breaker to Off.
6. Set all upstream utility circuit breakers feeding the PDU to Off.
7. Disconnect the batteries in the Battery Enclosure and any XR Battery Enclosures by pulling them out to the red disconnect line.

DANGER—Risk of Electric Shock!



Hazardous, live parts may exist inside the PDU because of the Symmetra PX UPS inverter even when the AC power is disconnected. Test any electrical parts before touching them.

Emergency Power Off (EPO)

Hazardous voltage from the branch circuit must be isolated from the 24VAC, 24VDC, and contact closure. 24VAC and 24VDC are considered Class 2 circuits as defined in Article 725 of the National Electrical Code (NFPA 70) and Section 16 of the Canadian Electrical Code (C22.1).

A Class 2 circuit is a source having limited voltage and energy capacity as follows:

- a. If an Inherently Limited Power Source, voltage and energy are limited to less than 30VAC, less than 30VDC, and 8 A.
- b. If not an Inherently Limited Power Source, voltage and energy are limited to less than 30VAC, less than 60VDC, 250VA, and the current is limited to 1000/V max. The fuse is limited to 5 A if less than 20VAC or 20VDC, or 100/V maximum if less than 30VAC or 60VDC.

If you choose to use a 24VAC, 24VDC, or contact closure connection to the EPO, use one of the following UL-listed wire types:

- CL2 Class 2 cable for general purpose use
- CL2P Plenum cable for use in ducts, plenums, and other space used for environmental air
- CL2R Riser cable for use in a vertical run shaft from floor to floor
- CL2X Limited Use cable for use in dwellings and for use in a raceway
- For installation in Canada, the cable should be CSA Certified, type ELC (extra-low-voltage control cable).

If you do not use a CL2 cable, route the EPO wiring in conduit that does not contain any branch circuit wiring.

EMI

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. The user will bear sole responsibility for correcting such interference.

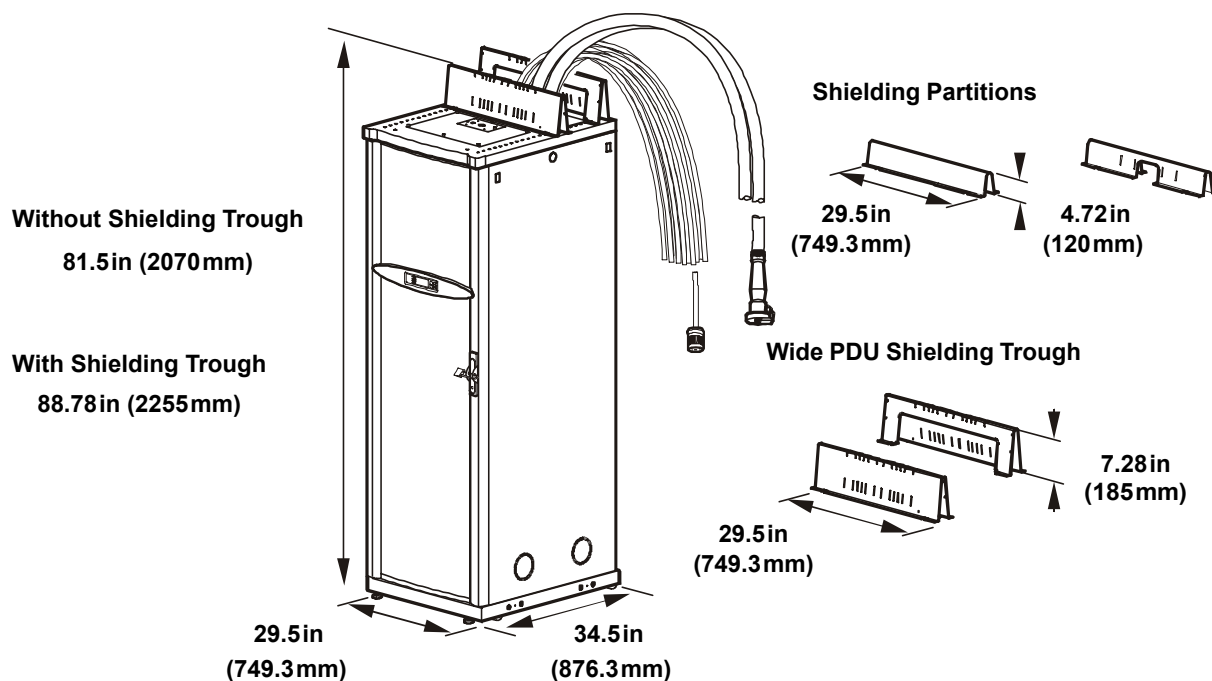
This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

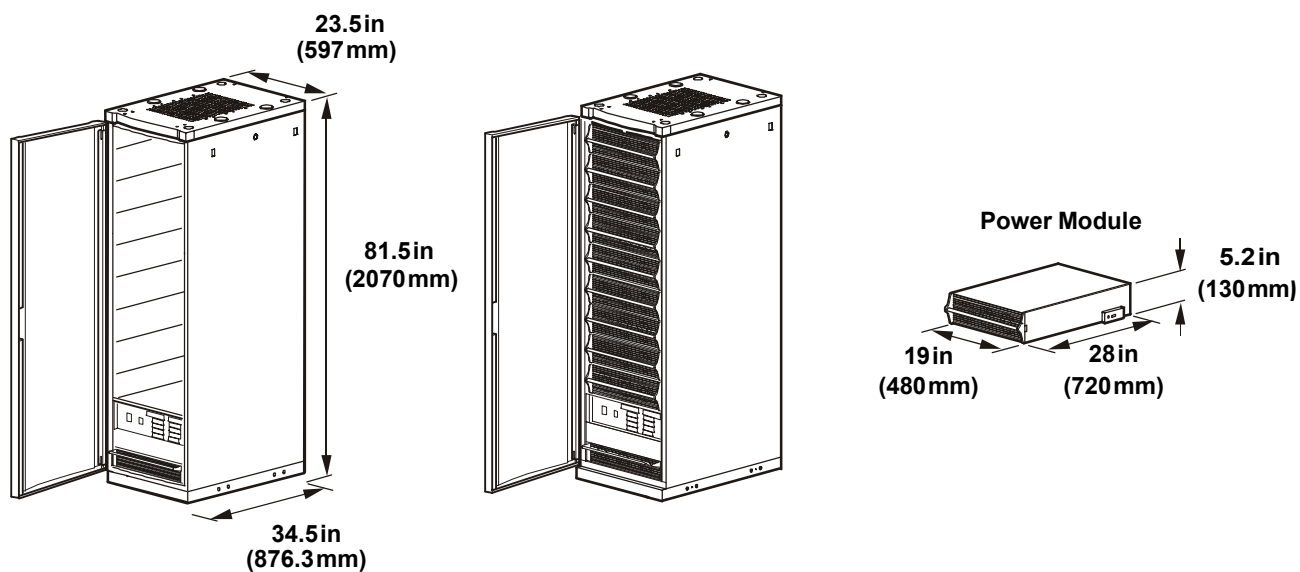
Site Planning

Dimensions

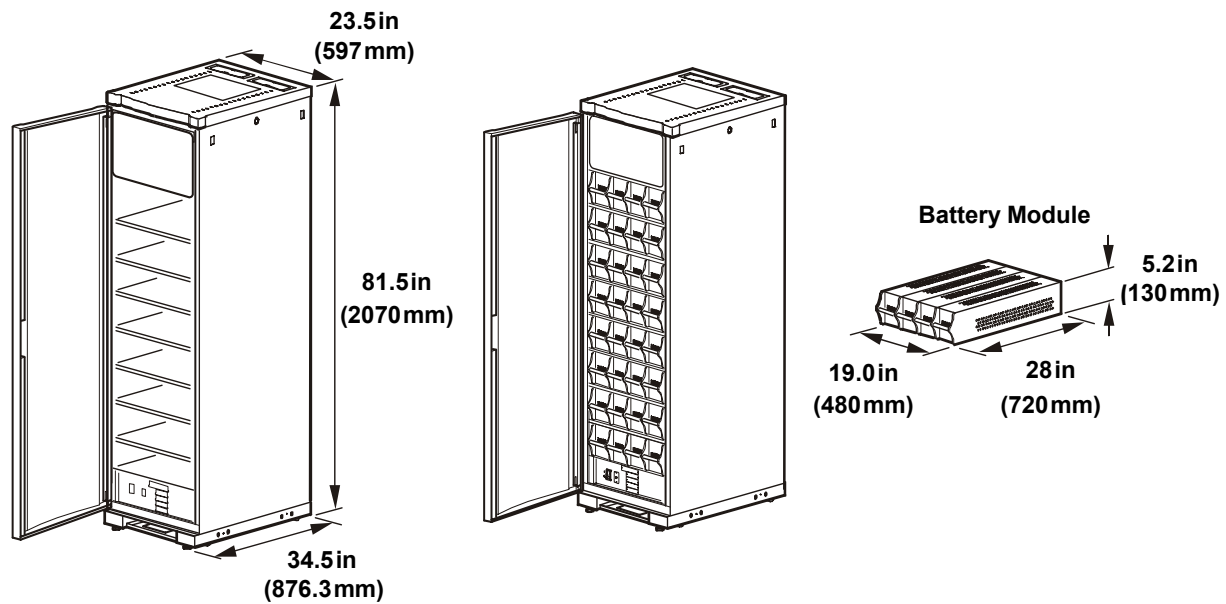
InfraStruXure PDU



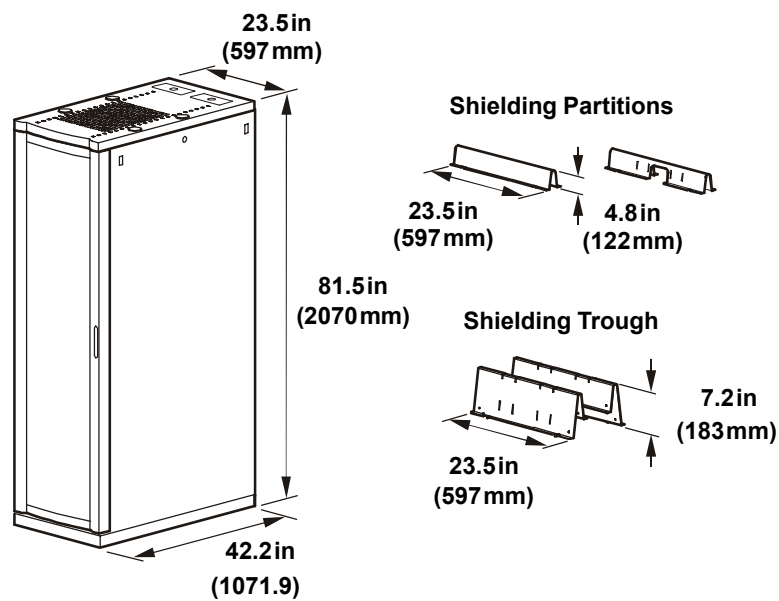
Symmetra PX UPS



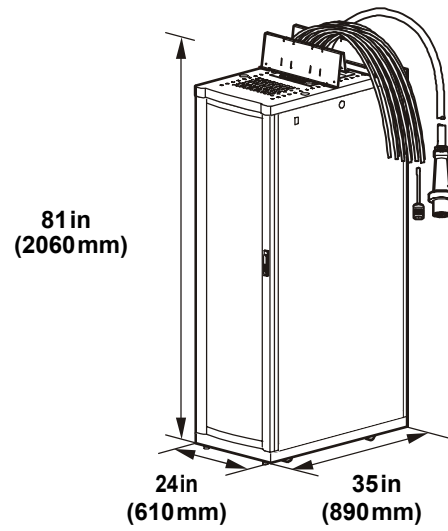
Battery Enclosure



NetShelter VX Enclosure

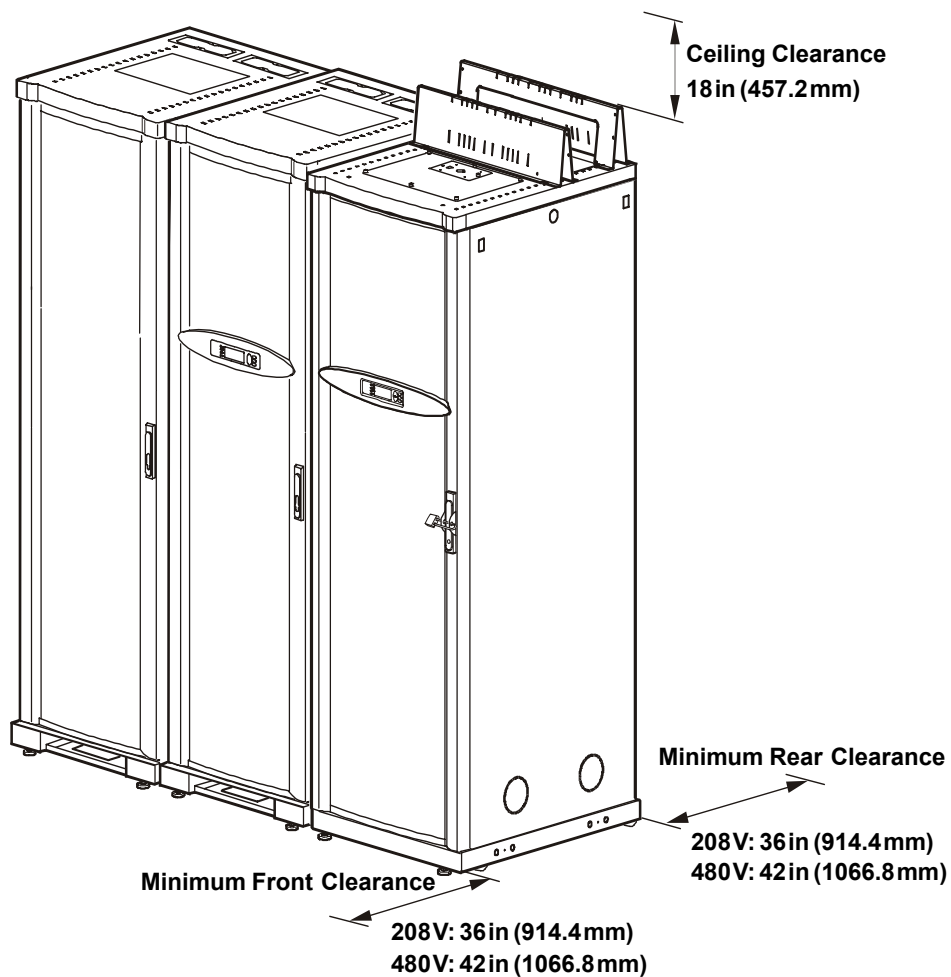


Rack Distribution Panel



Space Considerations

Study the figures below to determine your space requirements for installing the InfraStruXure PDU, Symmetra PX UPS, and Battery Enclosure. Consult your local codes and the NEC for additional requirements.



Weight Considerations

Ensure that the floor and sub-floor can support the total weight of the configuration when concentrated on the leveling feet. If you are placing equipment on a raised floor, consult the flooring manufacturer for loading requirements before installing equipment.

Component	Maximum Weight
InfraStruXure PDU	2100lb (953 kg)
Symmetra PX UPS	1700lb (775 kg)
Battery Enclosure	2152lb (976 kg)
NetShelter VX Enclosure (empty)	363lb (165 kg)

Heat Output

Consider the heat dissipation ratings of equipment to determine cooling requirements. Additional cooling equipment may be required. The following table shows the heat output of the InfraStruXure PDU and the Symmetra PX UPS.

InfraStruXure PDU

208 V	6,165 BTU/hr. (1.81 kW)
-------	-------------------------

480 V	5,079 BTU/hr. (1.49 kW)
-------	-------------------------

600 V	5,527 BTU/hr. (1.62 kW)
-------	-------------------------

Symmetra PX UPS	23,757 BTU/hr. (6.96 kW)
------------------------	--------------------------



Note

The heat output is higher while batteries are charging. Under normal operating conditions, battery recharging periods are infrequent.

Electrical Requirements and Specifications

Procedures requiring a licensed electrician



Procedures requiring a licensed electrician include:

- Connection of utility conductors
- Installation of a 350-, 150-, or 125-amp circuit breaker
- Connection to the Main Input switch
- Connection to a branch circuit
- Connection to the cross tie output breaker



To connect utility conductors, see *Certified Electrician's Instructions* (990-1469A) included with your InfraStruXure PDU documentation.

Electrical requirements

	208VAC	480VAC	600VAC
Upstream circuit breaker ^{† ‡}	350 A	150 A	125 A
Conductors to Main Input switch ^{† ‡*}	3W + G, 4W + G*	3W + G + GEC to building steel	
Conductors to the Bypass Input switch ^{† ‡}	4W + G		
Conductors to the Cross Tie Output breaker ^{† ‡}	4W + G		
Recommended wire sizing [‡]			
L1, L2, L3	400kcmil (350 A)	1/0 AWG (150 A)	2 AWG (125 A)
N*	400kcmil	1/0 AWG	2 AWG
G	3 AWG	6 AWG	6 AWG
GEC	1/0 AWG	6 AWG	8 AWG
Torque according to wire size			
L1, L2, L3	Underfloor Wiring: 500 in-lbs, Overhead Wiring: 160 in-lb (18 Nm) of lugs onto the circuit breaker		
N	125 in-lb		
G, GEC	45 in-lb if single terminal (ground), 50 in-lb if double terminal (G + GEC)		

* Transformerless PDUs only.

† Provided by customer.

‡ Consult local and national codes for sizing requirements.

Overview

The diagram illustrates a power distribution system with two identical PDU racks, PDU A and PDU B. Each rack is connected to two power sources: POWER SOURCE A and POWER SOURCE B. The connections are as follows:

- POWER SOURCE A:**
 - Connects to the input of the Input Step-down Transformer in PDU A.
 - Connects to the input of the Input Step-down Transformer in PDU B.
 - Connects to the input of the Input Step-down Transformer in PDU A.
 - Connects to the input of the Input Step-down Transformer in PDU B.
- POWER SOURCE B:**
 - Connects to the input of the Input Step-down Transformer in PDU A.
 - Connects to the input of the Input Step-down Transformer in PDU B.
 - Connects to the input of the Input Step-down Transformer in PDU A.
 - Connects to the input of the Input Step-down Transformer in PDU B.
- PDU A:**
 - Contains an Input Step-down Transformer.
 - Contains three output modules labeled A, B, and X.
 - Module A is connected to the transformer.
 - Module B is connected to the transformer.
 - Module X is connected to the transformer.
 - The output of the transformer is connected to the input of the Input Step-down Transformer.
 - The output of the transformer is connected to the input of the Input Step-down Transformer.
 - The output of the transformer is connected to the input of the Input Step-down Transformer.
- PDU B:**
 - Contains an Input Step-down Transformer.
 - Contains three output modules labeled A, B, and X.
 - Module A is connected to the transformer.
 - Module B is connected to the transformer.
 - Module X is connected to the transformer.
 - The output of the transformer is connected to the input of the Input Step-down Transformer.
 - The output of the transformer is connected to the input of the Input Step-down Transformer.
 - The output of the transformer is connected to the input of the Input Step-down Transformer.

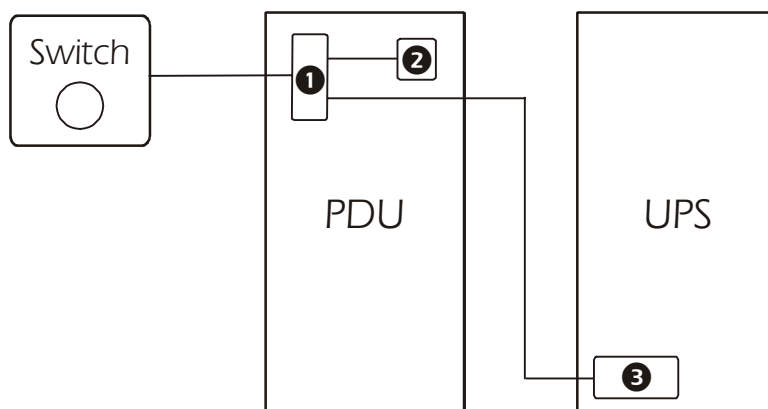
The purpose of a 2N system is to use two UPSs such that if something were to happen to one of the UPSs, the other UPS is available to supply power to the load equipment. 2N systems provide an added benefit for 480V and 600V power distribution systems in that isolation transformers are not required to step down the 480V or 600V input to 208V because transformers in the PDUs perform this task.

It is important to note that the cross tie feature is to be used on 2N dual-fed systems only. The cross tie circuit breaker is not to be used to supply power to any other load device. Cross tie connections are made through the load-side terminals of a molded-case circuit breaker, located in the front, upper, right-hand side of the PDU. PDUs with the bottom feed option are supplied with terminals on the front, lower, right-hand side of the PDU.

Emergency Power Off (EPO)

Overview

To provide a mechanism for emergency power off, attach a remote switch (not included) to the EPO interface on the PDU monitoring unit. The EPO interface (❶) is connected to the PDU Main Input switch (❷) and to the UPS internal EPO switch (❸). (Control wires from the PDU to the UPS are connected during installation of the InfraStruXure system.)



When the EPO is activated, the main input circuit breaker to the PDU transformer is opened, the UPS DC Disconnect breaker is opened, and the UPS System Enable switch is turned off. In this sequence, there is not power from the PDU transformer and there is no power from the UPS inverters and batteries.



Note

APC offers an optional InfraStruXure EPO System (EPW9). Contact your APC sales representative, or visit the APC Web site (www.apc.com) for more information.



See “Connect an Emergency Power Off Switch” on page 33 for instructions on how to connect an EPO switch to the PDU.

Basic Installation Procedure

This section provides the basic steps that you need to perform when installing InfraStruXure power and rack components. Follow the references provided with each step for detailed instructions.



Do not begin installing your InfraStruXure system without an APC Field Service Engineer present.

1. Unpack the components according to the unpacking instructions included on the outside of the packaging or in the installation manual included with the component.



Search all boxes and packaging to make sure that they are empty before discarding.

2. Determine the correct placement of your system components by studying your InfraStruXure Configure-To-Order (CTO) Report. Move the Symmetra PX UPS, InfraStruXure PDU, RDP, Battery Enclosure, and NetShelter VX Enclosures to their final location.



If installing InfraStruXure on a raised floor, make sure that the raised-floor structure has a lb/in² rating that will support the full weight of the InfraStruXure installation. See “Weight Considerations” on page 9.

3. Level the PDU, UPS, RDP, NetShelter, and Battery Enclosures, using the 13/14-mm wrench included with each unit.



See page 18 for detailed instructions.

4. Exchange side panels and run battery communication cables.



See page 20 for detailed instructions.

5. Join adjacent enclosures.



For instructions on joining the PDU, UPS, and Battery Enclosure see page 22.



See also

For instructions on joining to RDP to a NetShelter VX Enclosure, or joining adjacent NetShelter VX Enclosures, see the installation manual included with your enclosures.

6. Ensure total power off.



See page 23 for detailed instructions.

7. Connect utility conductors to the PDU.

A licensed electrician must connect utility power.



See also

For instructions, see *Certified Electrician's Instructions* (990-1469A) included with your InfraStruXure PDU documentation.

8. Connect AC power and control wiring.



See page 26 for detailed instructions.

9. Connect DC power wiring.



See page 30 for detailed instructions.

10. Connect an EPO switch to the PDU user connection plate.



See page 33 for detailed instructions.

11. Connect user input contacts and relay outputs to the PDU user connection plate, if applicable.



See page 37 for detailed instructions.

12. Install Shielding Troughs, Shielding Partitions, and Cable Ladders.



See page 39 for general information.



See also

For detailed information and grounding instructions, see the instruction sheet included with the Shielding Troughs and Shielding Partitions (990-1393B).



See also

For more information on installing and grounding the Cable Ladders see the instruction sheet included with the cable ladders (990-1576).

13. Install the Rack Automatic Transfer Switches (ATS), Rack Power Distribution Units, and other InfraStruXure rack-mount devices.



See also

For instructions, see the manuals included with your Rack ATS, Rack PDU, or other InfraStruXure rack-mount device.

14. Route and attach power cables to RDPs and to each Rack ATS and/or Rack PDUs.



See page 41 for detailed instructions.

15. Route and attach communication cables to the InfraStruXure Manager hub (or switch).



See page 46 for detailed instructions.

16. Start the system.

Only qualified, APC-trained personnel may perform a system start-up.



See page 45 for detailed instructions.

17. Configure the InfraStruXure Manager.



For instructions, see the manual included with your InfraStruXure Manager.

See also

Tools Required

The following tools are required to perform the procedures in this manual. Additional tools may be required for components not covered in this manual.

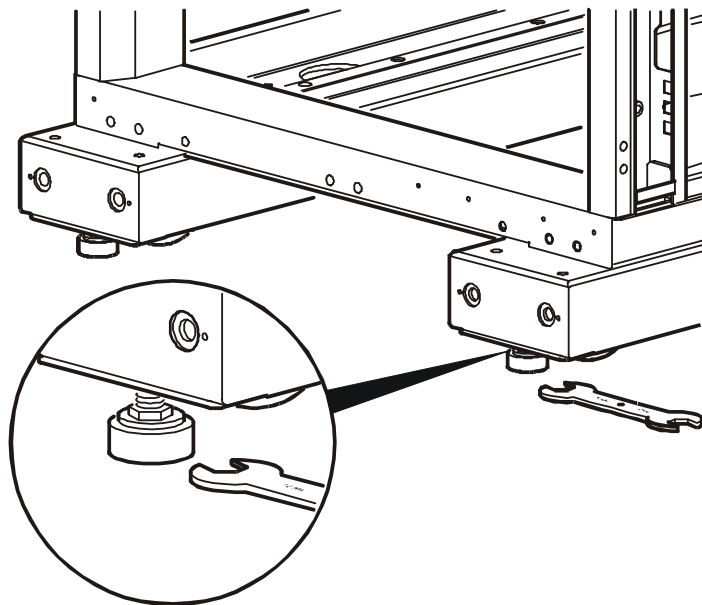
Tool	Supplied?
13-mm socket wrench	No
17-mm socket wrench	No
T-20 screwdriver	No
Standard screwdriver	No
Level	No
Open-ended wrench (14 mm) for adjusting the leveling feet	Yes
Step ladder	No
Crimper	No
Volt-meter	No
Phase-rotation meter	No

Installation Procedures

Level the PDU, UPS, RDP, NetShelter and Battery Enclosures

Leveling feet are attached under the enclosure at each corner. The leveling feet can help provide a stable base if the selected floor space is uneven, but they are not intended to compensate for a badly sloped surface. To level the enclosure:

1. Fit the 14-millimeter end of the open-ended wrench (provided) to the hex head just above the round pad on the bottom of the leveling foot. Turn the wrench clockwise to extend the leveling foot until it makes firm contact with the floor.

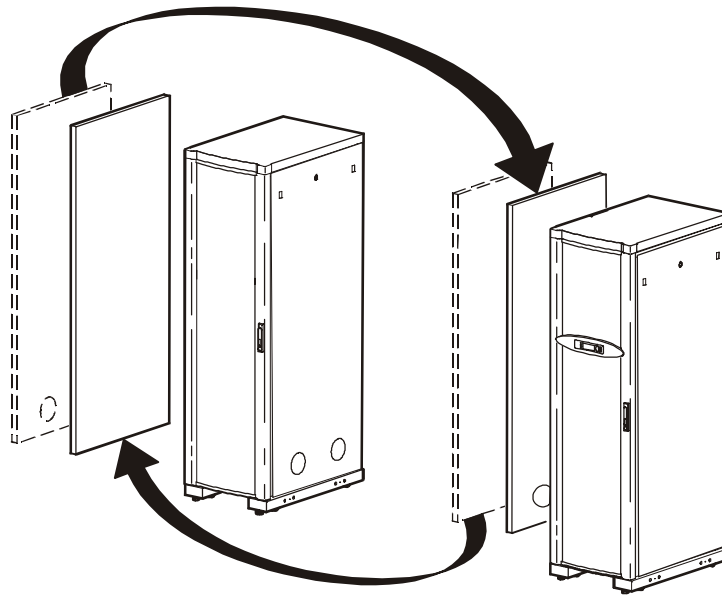


2. Repeat step 1 for each of the remaining leveling feet.
3. Use a level to determine which feet need further adjustment to level the enclosure. Adjust as necessary.

Exchange Side Panels

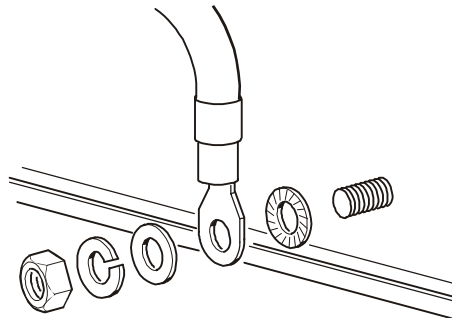
Before installing the InfraStruXure PDU, Symmetra PX UPS, and Battery Enclosure, you will need to exchange side panels so that the **adjacent** panels will have matching holes for joining the enclosures together and for routing input and output wiring between them. The following side panels will need to be exchanged:

- Adjacent side panels of a PDU and UPS
- Adjacent side panels of a Battery Enclosure and a UPS
- Adjacent side panels of two Battery Enclosures

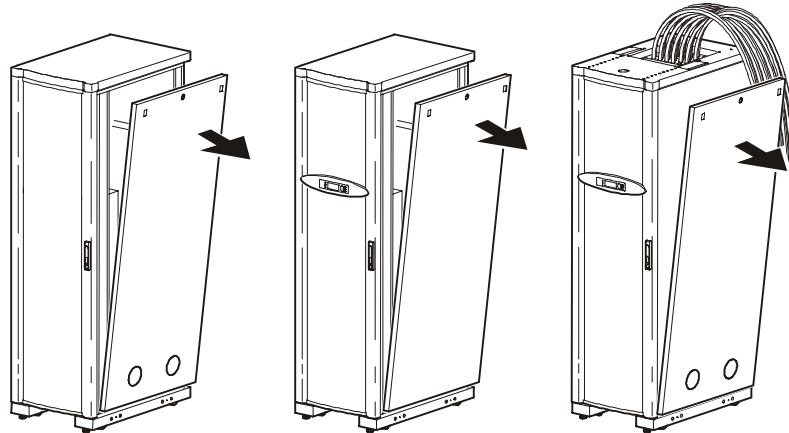


To exchange side panels:

1. Detach the ground wires from the side panels that you will be exchanging.



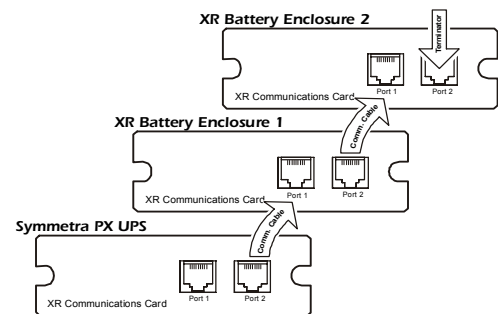
2. Remove the solid side panels from the sides of the UPS that will be adjacent to the PDU and the Battery Enclosure in your planned configuration.
3. Remove the side panels from the sides of the PDU and Battery Enclosure that will **not** be adjacent to the UPS.



4. Remove the rear hole covers from the panels that you removed in step 3.

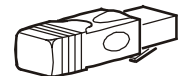
Connect Battery Enclosure communication cables:

5. Route the communication cable through the hole between the UPS and the Battery Enclosure. Route the cable from the side of the UPS to which it is attached, around the back of the UPS, and through the hole on the other side of the UPS to the front of the Battery Enclosure.
6. Connect the cable to **Port 1** on the first adjacent Battery Enclosure's XR Communication Card.
7. Connect **Port 2** on the first Battery Enclosure to **Port 1** on the next Battery Enclosure. Route the cable the same way as described in step 5. Continue until all XR Communication Cards are connected.
8. Locate the XR Communication Card terminator and insert it into the open port of the last Battery Enclosure in your configuration.



Note

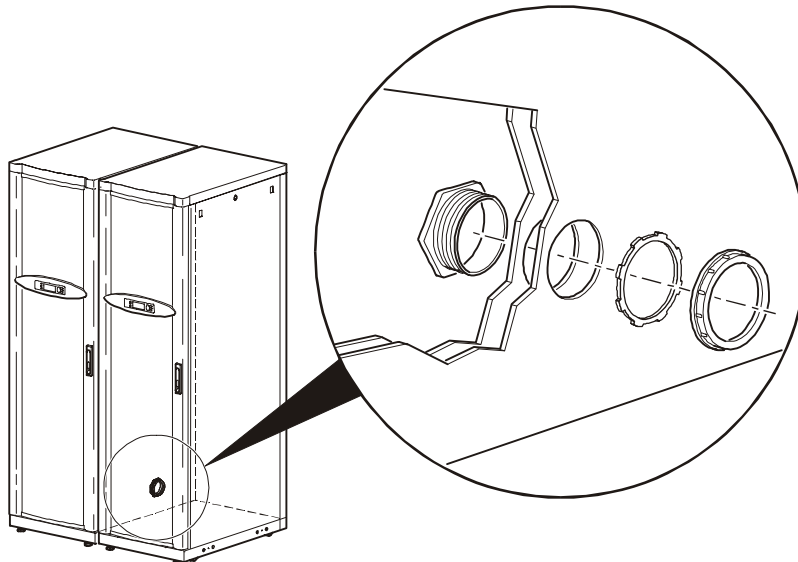
The terminator is in **Port 1** of the UPS XR Communication Card and in **Port 2** of the Battery Enclosure XR Communication Card.



9. Install, on the UPS, the side panels that you removed from the PDU and the Battery Enclosure in step 3 and reattach the ground wires.
10. Install, on the PDU and the Battery Enclosure, the solid side panel that you removed from the UPS in step 2 and reattach the ground wires.

Attach the PDU, UPS, and Battery Enclosure

1. Move the PDU, Symmetra PX UPS, and Battery Enclosures into position, aligning the holes in the adjacent side panels.
2. Level the PDU, Symmetra PX UPS, and Battery Enclosure by using a level and adjusting the leveling feet on each enclosure.
3. Thread the chase nipple (part number: 820-0071) through the opening in the adjacent side panels of the enclosures. The following enclosures will need to be attached:
 - An adjacent PDU and UPS
 - An adjacent Battery Enclosure and UPS
 - Adjacent Battery Enclosures



4. Tighten the lock-nut and the bushing on the chase nipple.

Ensure that All Power is Off



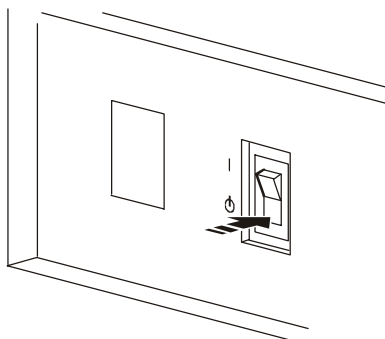
Before you proceed, ensure that power is off by following the procedure in this section.



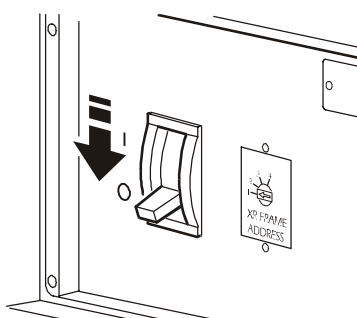
Do not install any batteries into the Battery Enclosure or power modules into the Symmetra PX UPS until instructed to do so.

How to ensure that all power is off

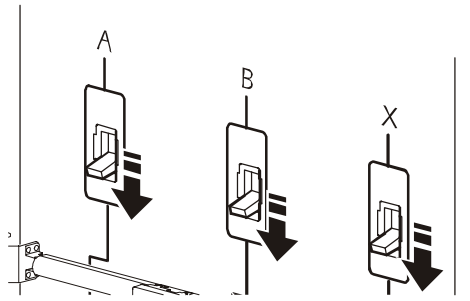
1. Set the UPS **System Enable** switch to OFF.



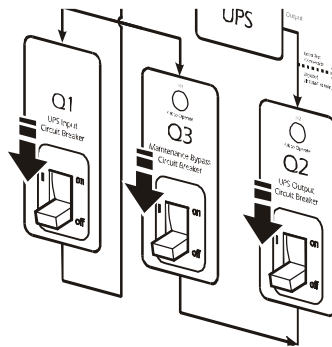
2. Set the Battery Enclosure **DC Disconnect** breaker to OFF.



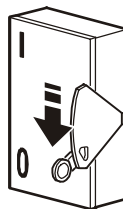
3. Set the **Main Input (A)** and **Bypass Input (B)** switches and the **Cross Tie Input (X)** circuit breaker (if applicable) on the PDU to the OFF position.



4. Open (turn OFF) the **Q1**, **Q2**, and **Q3** circuit breakers on the PDU.



5. Set each upstream utility circuit breaker that will feed the PDU to OFF.



Connect Utility Conductors to the PDU



Warning

Only a certified electrician can connect utility conductors to the InfraStruXure PDU.



See also

For detailed instructions see *Certified Electrician's Instructions* (990-1469A), which was included with your PDU documentation.

Connect AC Power and Control Wiring



Note

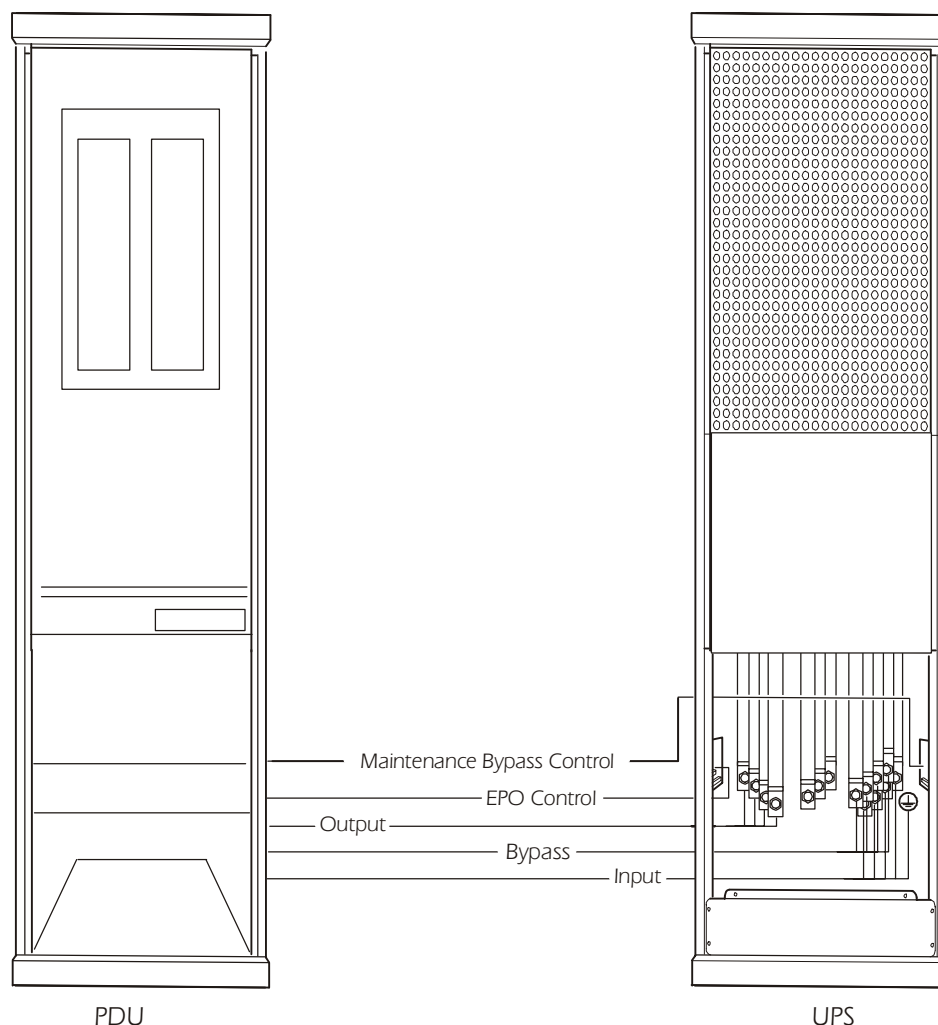
Before you connect AC power and control wiring, connect utility conductors to the PDU. For instructions, see *Certified Electrician's Instructions* included with the PDU documentation.



Electrical
Hazard

Only qualified personnel trained by APC may connect the AC power and control wiring.

Attach AC power and control wiring to the UPS. The power wires are coiled in the bottom of the PDU. There are five main input wires, four bypass input wires, and four output wires coiled on the floor of the PDU. Each set of wires is labeled. The control wires for the UPS Maintenance Bypass control board and the UPS EPO control board are also coiled in the PDU. The diagram below provides an overview of the connections that you will make between the PDU and the UPS.



To make the connections you will need to remove the rear lower panel of the UPS and the rear panel of the PDU. Use the opening in the side panels of the enclosures to run the wires.

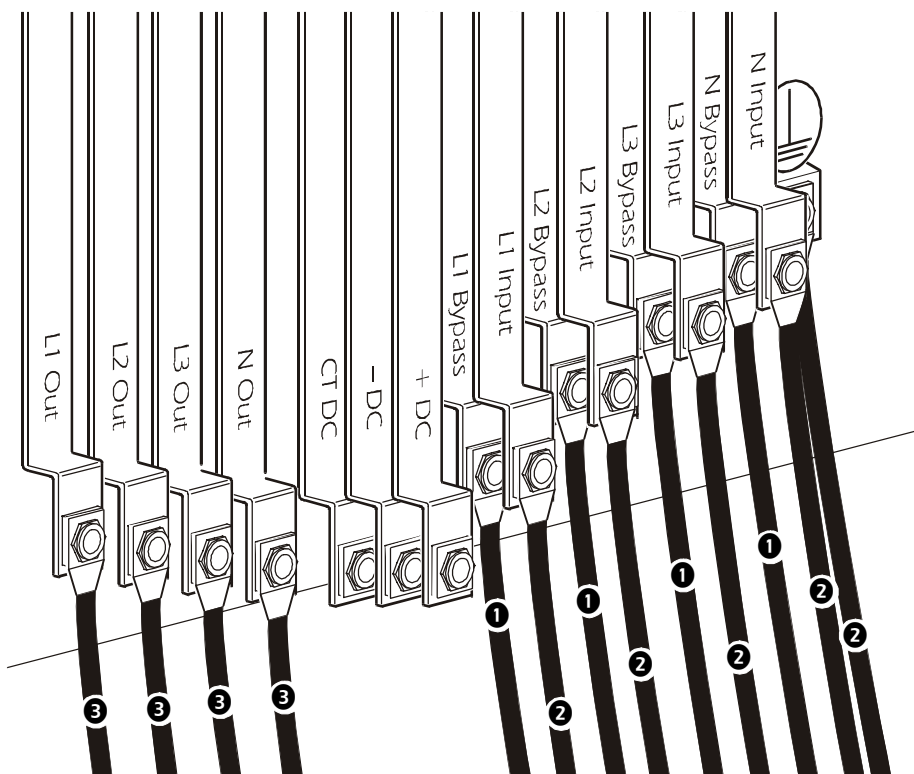
Connect AC power wiring.

1. Attach the **bypass** wires (**L1, L2, L3, N**) to the four UPS bypass bus bars with corresponding labels (❶).
2. Attach the **input** wires (**L1, L2, L3, N**) to the four UPS input bus bars with corresponding colors and labels (❷). And, attach the input ground wire (**G**) to the ground lug to the right of the input bus bars marked (⏚).
3. Attach the **output** wires (**L1, L2, L3, N**) to the four UPS output bus bars with corresponding colors and labels (❸).

The following illustration shows the UPS buswork and the order in which you need to make the connections. The numbers in the illustration correspond to the numbered steps above (1–3).

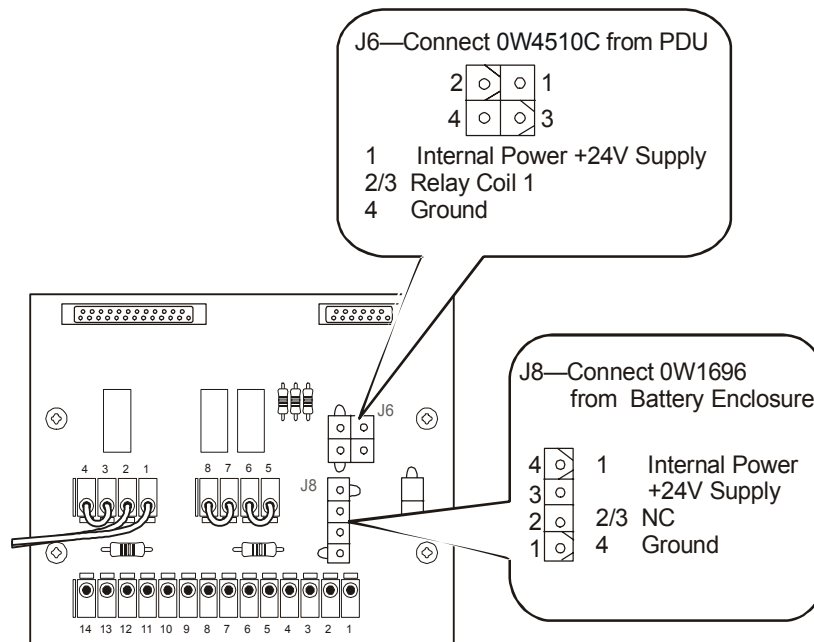


The conductors are not interchangeable, and must be terminated in the correct location to prevent damage to the system and connected equipment.

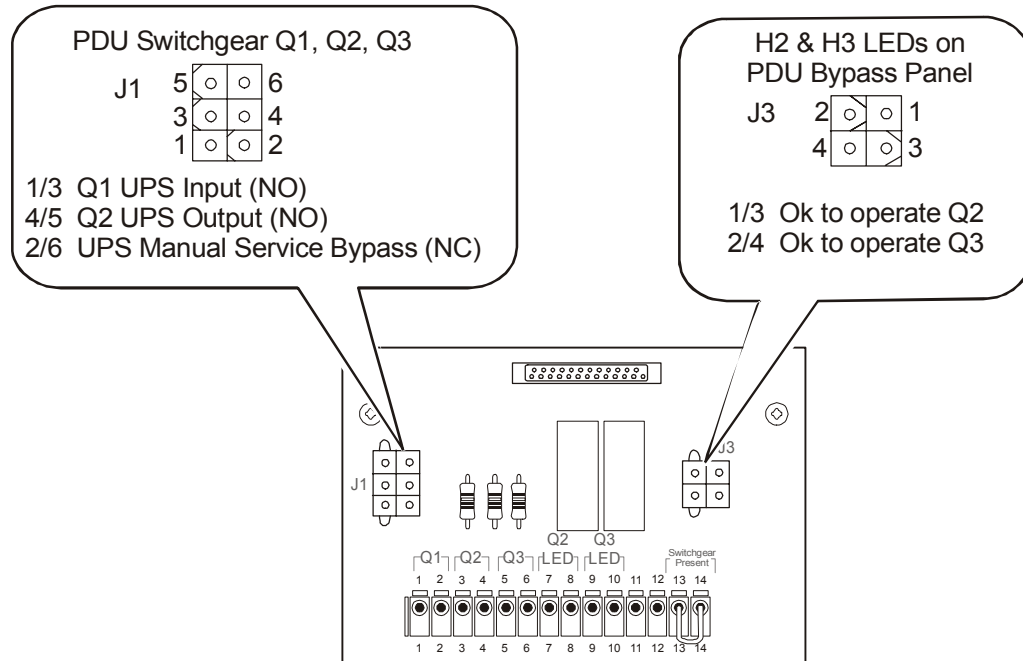


Connect control wiring.

4. Connect the EPO control wires from the PDU and Battery Enclosure to the EPO board on the UPS. The control wires are harnessed and coiled in the floor of the PDU and Battery Enclosure, respectively. The PDU harness connects to a 4-pin molex connector labeled **J6** and the Battery Enclosure harness connects to a 4-pin molex connector labeled **J8**.



5. Connect the Maintenance Bypass control wire harness from the PDU to the Maintenance Bypass interface board of the UPS. There are two wire harnesses coiled and secured in the PDU. One is a 6-wire harness and the other is a 4-wire harness.



A jumper wire must be installed in position 13 and 14.

Note

Connect DC Power Wiring



Only qualified personnel trained by APC may connect the Battery Enclosure to the Symmetra PX UPS or to another Battery Enclosure.



The supplied power and ground wires are for internal side-panel wiring only. These wires are not for use in external conduits.

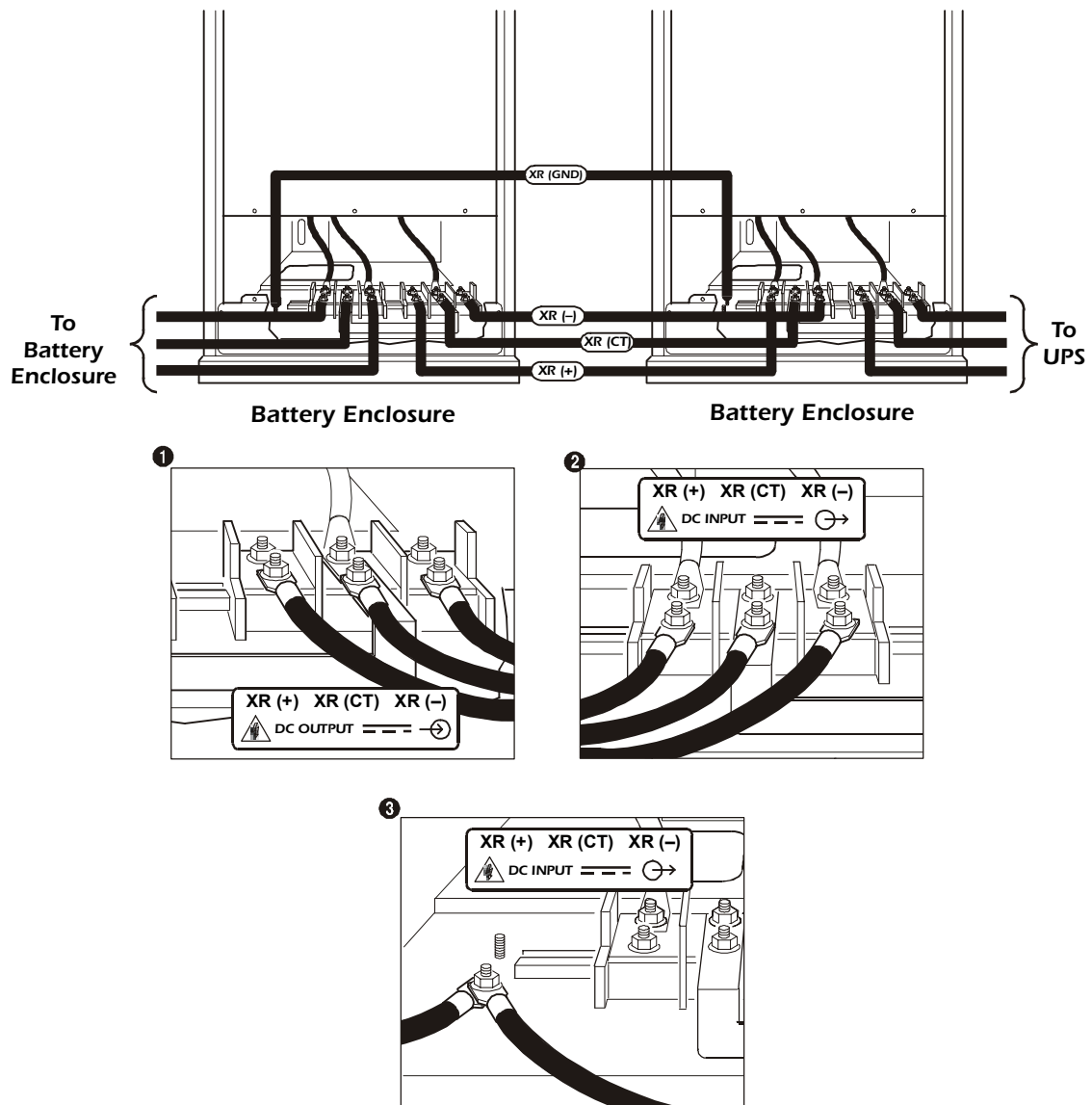


Before you begin connecting the DC power wiring, ensure that there are no battery units installed in the Battery Enclosures. Do not install battery units until instructed to do so.

Cascade Battery Enclosures

If you have multiple Battery Enclosures as part of your InfraStruXure system, you can cascade Battery Enclosures to form a “daisy-chain” to a Symmetra PX UPS. Starting with the Battery Enclosure furthest away from the UPS:

1. Route DC output cables and the ground cable (coiled on the floor of the enclosure) from one Battery Enclosure to the next Battery Enclosure through the adjacent holes in the side panels of the enclosures.
2. Connect the DC output cables from one Battery Enclosure to the DC Input Breaker of the next Battery Enclosure [(+) to (+), (CT) to (CT), (-) to (-)].
3. Connect the ground wire from one Battery Enclosure to the grounding stud on the next Battery Enclosure.



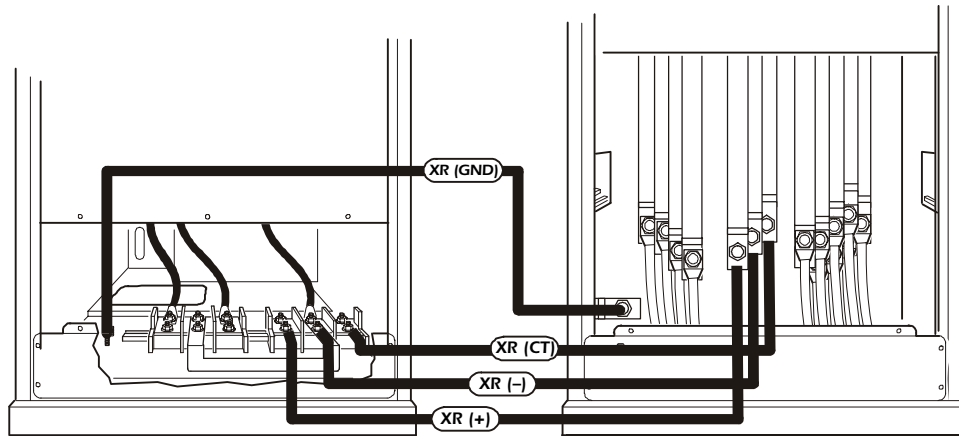
Connect power cables from the Battery Enclosure to the Symmetra PX UPS

1. Route the Battery Enclosure DC output cables to the Symmetra PX UPS through the hole in the adjacent side panels.
2. Connect the Battery Enclosure DC output cables to the Symmetra PX UPS DC input terminal [(+) to (+), (CT) to (CT), (-) to (-)].



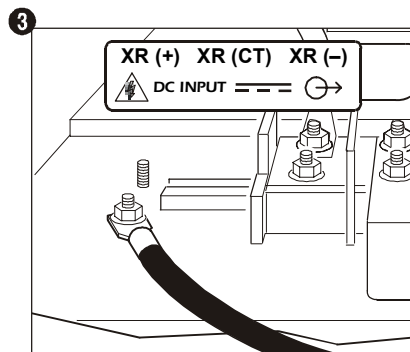
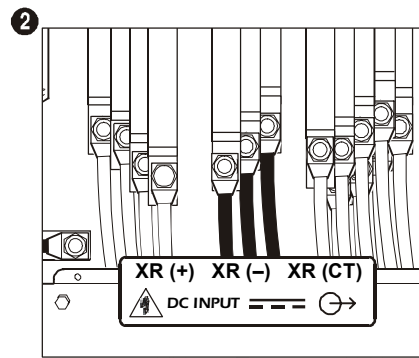
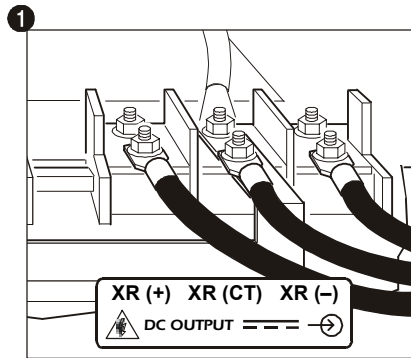
Tighten the lugs on the terminals only to the torque specified: the power terminal lug diameter is 10 mm with a torque value of 53 lb/in (6Nm).

3. Connect the Battery Enclosure ground cable to the Symmetra PX UPS ground stud.



Battery Enclosure

Symmetra PX UPS



Connect an Emergency Power Off Switch

Overview

Connecting the switch. Choose one of the following methods to connect a switch to the EPO interface:

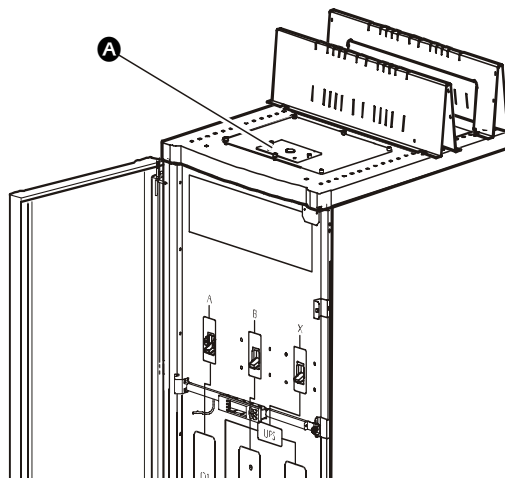
- Contact closure
- 24 VDC
- 24 VAC



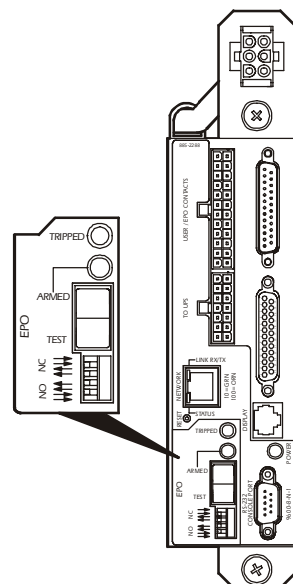
Note

Contact closure is recommended.

The EPO connections are made at the PDU user connection plate. The figure to the right shows the location of the user connection plate. It is mounted on the roof of the PDU enclosure (A) and connections are made from inside the PDU. Use the knockout in the plate to run wires out the roof of the PDU.



Configuring and testing. Configuring and testing of the switch is done through the EPO interface on the PDU monitoring unit. The figure to the right shows the PDU monitoring unit and the location of the EPO LEDs and switches.



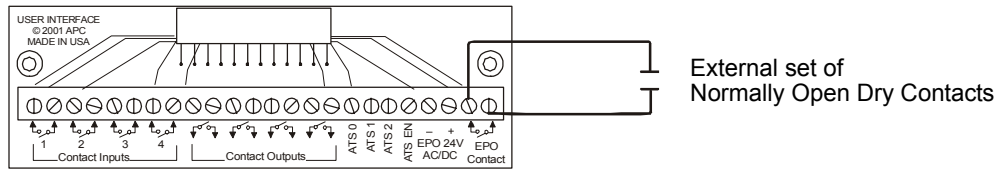
Note

APC offers an optional InfraStruXure EPO System (EPW9). Contact your APC sales representative, or visit the APC Web site (www.apc.com) for more information.

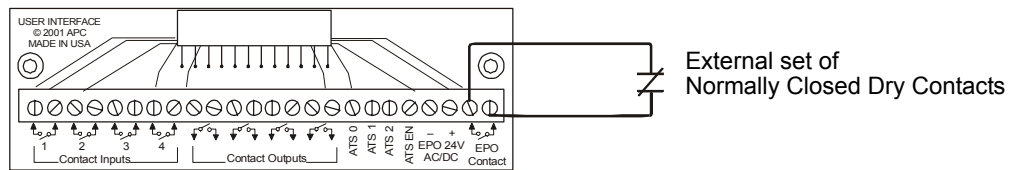
Connect an EPO switch to the user connection plate and test the switch

1. Connect the switch to the EPO connection point terminals located on the bottom side of the PDU user connection plate. Read the label next to the terminal block to determine which terminals to connect to for the signal type you are using:

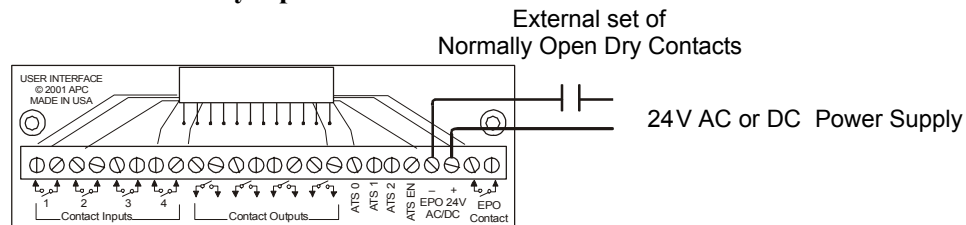
– Contact Closure—Normally Open



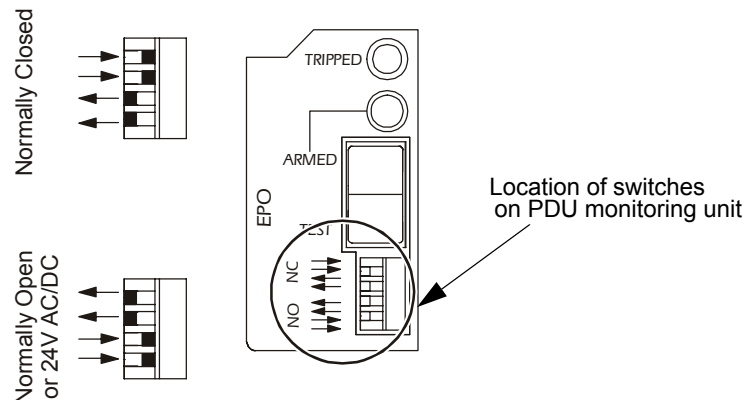
– Contact Closure—Normally Closed



– 24VAC/VDC—Normally Open



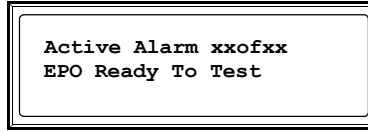
2. Verify that the EPO DIP switches on the PDU monitoring unit are configured properly for the signal type you are using. The labels above the switches and the figure below show the correct settings for both the Normally Open (NO) and Normally Closed (NC) position.



The default setting on the EPO interface on the PDU monitoring unit is for a **Normally Open (NO)** switch.

3. Test the EPO switch to ensure that it is wired and working correctly:

- a. Place the **Arm/Test rocker** switch in the **Test** position. The EPO state LEDs will be off and the PDU display interface will show the following alarm (in addition to any other active alarms):



- b. Engage the EPO switch. (If your switch is momentary, engage it with one person watching the EPO state LEDs, and another at the EPO switch.)
- c. Observe the EPO LEDs. If the switch is wired and working properly, when the switch is engaged, both of the EPO state LEDs are red.
- d. If the test was successful, place the **Arm/Test rocker** switch back to the **Arm** position. The PDU display interface will clear the EPO test mode alarm. If the test was not successful, see the troubleshooting chart:

Problem	Action
Neither state LED was red when EPO switch was engaged	• Check the wiring to your EPO switch. • Check to make sure the EPO DIP switch configuration is correct for your switch (NO or NC). See step 2 on the previous page for proper configuration instructions.
Only one of the state LEDs was red when EPO switch was engaged	• Check to make sure the EPO DIP switch configuration is correct for your switch (NO or NC) and test again. See step 2 on the previous page for proper configuration instructions. • If the switch is configured correctly and both LEDs are not red after testing again, contact customer support at a number on the back cover of this manual.

- e. Repeat this test for each EPO switch installed.
4. Ensure that the **Arm/Test rocker** switch is in the **Arm** position on the monitoring unit.

Safety warnings

Hazardous voltage from the branch circuit must be isolated from the 24VAC, 24VDC, and contact closure. 24VAC and 24VDC are considered Class 2 circuits as defined in Article 725 of the National Electrical Code (NFPA 70) and Section 16 of the Canadian Electrical Code (C22.1).

A Class 2 circuit is a source having limited voltage and energy capacity as follows:

- a. If an Inherently Limited Power Source, voltage and energy are limited to less than 30VAC, less than 30VDC, and 8A.
- b. If not an Inherently Limited Power Source, voltage and energy are limited to less than 30VAC, less than 60VDC, 250VA, and the current is limited to $1000/V$ max. The fuse is limited to 5A if less than 20VAC or 20VDC, or $100/V$ maximum if less than 30VAC or 60VDC.

If you choose to use a 24VAC, 24VDC, or contact closure connection to the EPO, use one of the following UL-listed wire types:

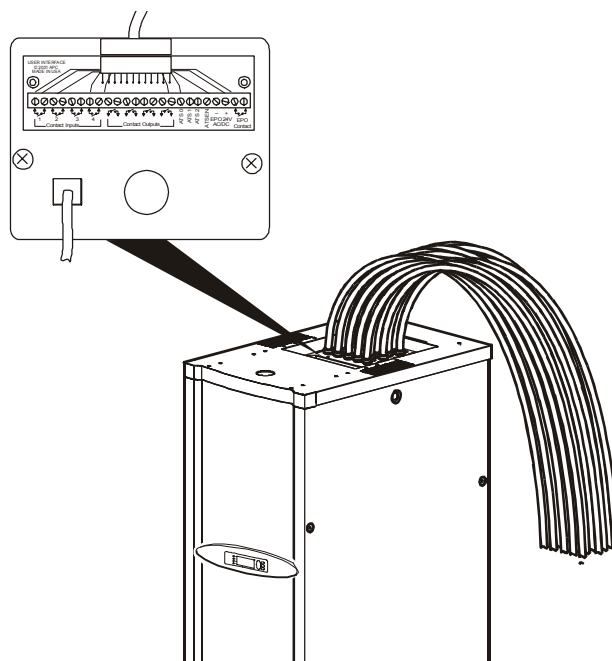
- CL2 Class 2 cable for general purpose use
- CL2P Plenum cable for use in ducts, plenums, and other space used for environmental air
- CL2R Riser cable for use in a vertical run shaft from floor to floor
- CL2X Limited Use cable for use in dwellings and for use in a raceway
- For installation in Canada, the cable should be CSA Certified, type ELC (extra-low-voltage control cable).

If you do not use a CL2 cable, route the EPO wiring in conduit that does not contain any branch circuit wiring.

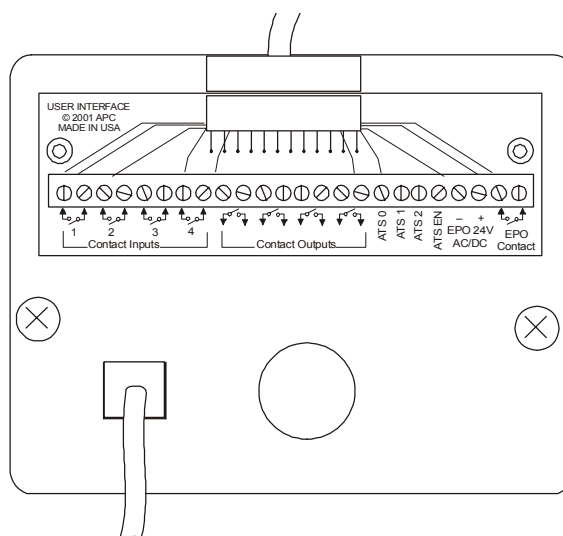
Connect User Input Contacts and Relay Outputs to the User Connection Plate

Overview

The figure below shows the location of the user connection plate. It is mounted on the roof of the PDU enclosure, and the connections are made from inside the enclosure. Use the knockout in the plate to route cables to and from the user connections on the plate.



Make contact closure connections (NO or NC) at the user connection plate to monitor dry contacts. You can make eight connections—four input contacts and four relay outputs.



How to connect contacts to the PDU monitoring unit

1. Choose one or more contact numbers on the user connection plate to which you will connect the contacts. The user connection plate is connected to the PDU monitoring unit.
2. From the PDU display interface:
 - a. Press the ESC or ENTER key to go to the top-level menu screen.
 - b. Select **Contacts** on the top-level menu screen and press the ENTER key.
 - c. Press the ENTER key to select the number of the contact you are connecting. The continue arrow ↕ will appear next to the contact number.
 - d. Press the Up or Down arrow key to select the appropriate contact number and press the ENTER key.
 - e. Press the Down arrow key to enter a unique **Name** for the contact and to configure the **Normal** state of the contact (Open or Closed). The default **Normal** state is Open. Press the ENTER key to select the item you wish to configure.



You will be prompted for your password to configure these items.

Note

3. Connect contact wires (300 V-rated cabling required) to the terminal block on the user connection plate. You will need a 2.5-mm standard screwdriver.
4. Run the wires from the terminal block out the roof or under the floor of the PDU to your contact's location.



Ensure that wires are properly retained and away from high voltage lines and breakers.

Warning

Relay output specifications

Nominal switching capacity	1 A at 30 VDC
Maximum switching power	30 W
Maximum switching voltage	60 VDC
Maximum switching current	2 ADC
Maximum carrying current	2 ADC
Surge ratings	2 kV per Bellcore TA-NWT-001089 1.5 kV per FCC part 68

Install Shielding Troughs, Shielding Partitions, and Cable Ladders

Shielding Troughs and Shielding Partitions for overhead wiring along rows

If you ordered APC Shielding Troughs, Shielding Partitions, and Cable Ladders to route overhead wiring for your system, assemble the Shielding Troughs and the Shielding Partitions along the rows of enclosures and assemble the Cable Ladders between rows.

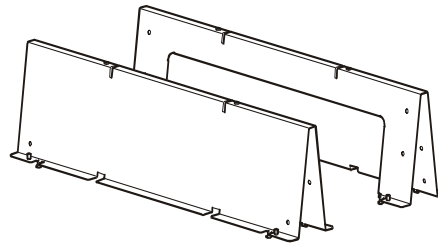


See also

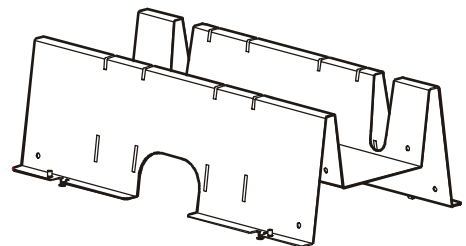
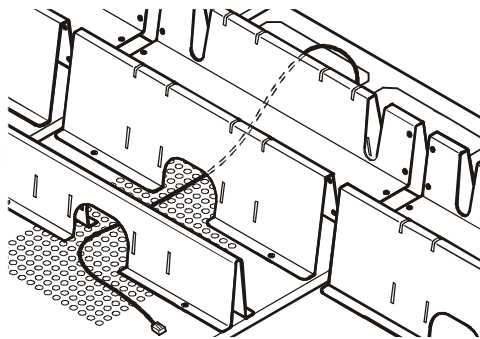
For detailed information and grounding instructions, see the instruction sheet included with the Shielding Troughs and Shielding Partitions (990-1393B).

Shielding Troughs. There are two types of Shielding Troughs:

- The PDU Wide Shielding Trough is 610mm in length and is not adjustable. The trough sits on top of the InfraStruXure PDU. The PDU Shielding Trough is two pieces. The power cables sit in between the two pieces when installed on the roof of the PDU.



- The NetShelter Shielding Trough is 610mm in length and is not adjustable. The Shielding Troughs have an opening in each side through which you route data cables to the Shielding Partitions.

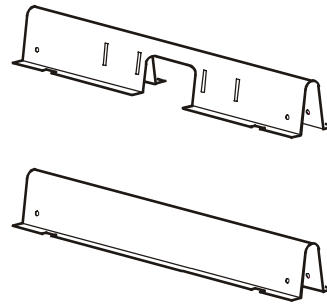


Shielding Trough accessories. APC offers the following accessories for Shielding Troughs:

- Shielding Trough Covers for both 600-mm wide (AR8174BLK) and 750-mm wide (AR8175BLK) enclosures. Contact APC for more information.
- Shielding Trough End Caps (AR8167BLK) to place on the side of a Shielding Trough at the end of a row. Contact APC for more information.

Shielding Partitions. There are two types of Shielding Partitions, each of which forms a side wall of a trough for data cables. You can customize the width of the trough for each row of your system — wider for rows carrying many data cables, narrower for rows carrying fewer.

- As the back wall, use a Shielding Partition that contains an opening for routing data cables.
- As the front wall, use a solid Shielding Partition to hide data cables for a clean appearance.



Cable Ladders for overhead wiring across rows

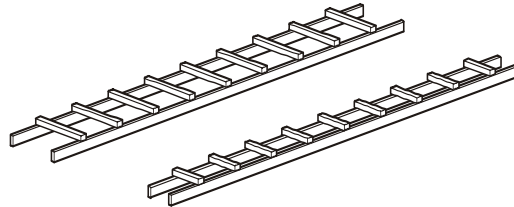
After installing the Shielding Troughs and Shielding Partitions, install the Cable Ladders between rows of enclosures. You can also run Cable Ladders across Shielding Troughs in the same row, using the hardware provided in the ladder kit.



See also

For detailed instructions on installing and grounding the Cable Ladders see the instruction sheet included with the cable ladders (990-1576).

Use wide Cable Ladders (12 in; 305 mm) where many power cables or data cables will run between rows; use narrow Cable Ladders (6 in; 152 mm) where few power cables or data cables will run between rows.



The Cable Ladders are 9 feet, 8 inches long. You can adjust the length of the Cable Ladders in the following ways:

- Cut the ends with a hacksaw to shorten them.
- Insert the connectors only partially into the side rails to extend them.



Note

Do not change the spacing between rows or the length and position of the Cable Ladders from the layout you planned with your APC representative when you placed your order. For overhead wiring, each PDU power cable is provided at a pre-determined length. Changes to the physical configuration of your system could cause some PDU power cables to be too short or too long.

Install InfraStruXure Rack-Mount Devices

Install the Rack Automatic Transfer Switches (ATS)

Install a Rack ATS in the top of each enclosure for overhead wiring, and in the bottom of each enclosure for wiring under the floor.



See also

See the installation instructions in the manual included with your Rack ATS.

The Rack ATS is an optional component and not all InfraStruXure systems will include them.

Install the Rack Power Distribution Units (PDU)

Install Rack PDUs in the rear of the NetShelter VX enclosure, in the channel directly behind the rear vertical mounting rails. For overhead wiring, make sure that the power cord is pointing toward the roof of the enclosure. For under the floor wiring, make sure that the power cord is pointing toward the floor.



See also

See the installation instructions in the manual included with your Rack PDU.

Install the InfraStruXure Manager and Hub (or Switch)

Install the InfraStruXure Manager in the enclosure closest to the InfraStruXure PDU. The CAT-5 data cables included with your configuration are of varying lengths, based on the distance components will be installed from the InfraStruXure PDU.



See also

See the installation instructions in the manual included with your InfraStruXure Manager.

Install the Environmental Monitoring Unit or Environmental Management System

Install the Environmental Monitoring Unit or Environmental Management System according to the installation instructions included with the device. The Environmental Monitoring Unit and Environmental Management System are optional components and not all InfraStruXure systems will include them.

Route and Attach Overhead Wiring

Connect the sub-feed power cable conductors to a three-pole breaker on the PDU



Only licensed electricians or APC Field Service Engineers can connect the sub-feed power cable conductors to a breaker on the PDU. Ensure that the RDP breakers are OFF before beginning this procedure.

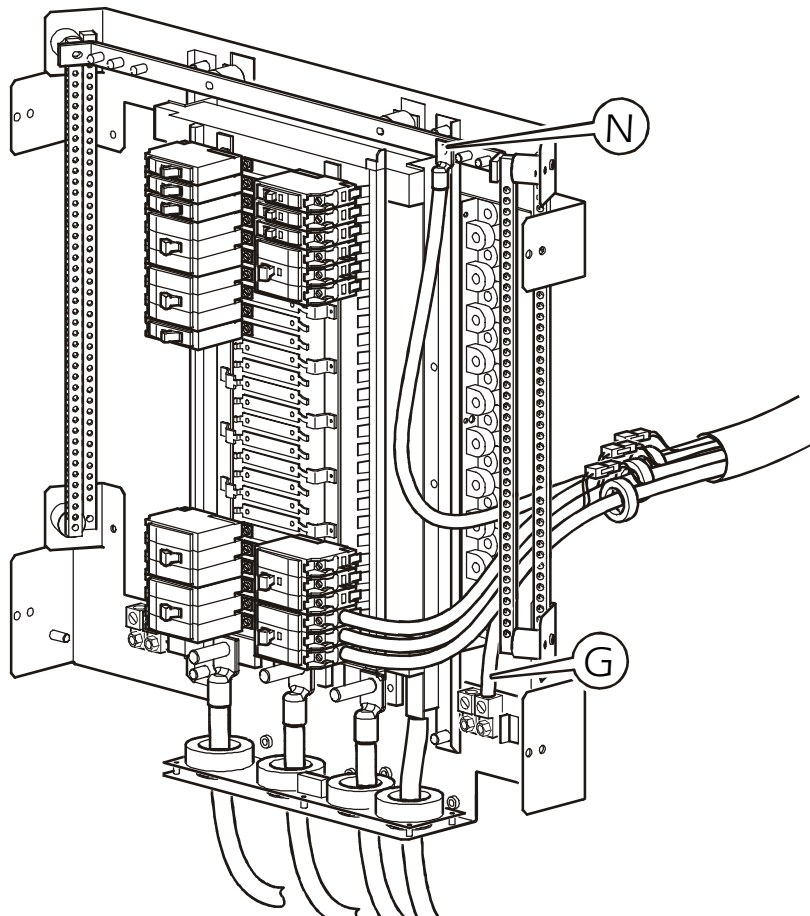
The sub-feed power cable is connected to the RDP and the cable's wires are terminated with ferrules.



If you ordered the alternative connection, your PDU and RDP have sub-feed power cables that terminate with IEC 309 connectors. If you have this option, the procedure below does not apply.

To connect the sub-feed power cable to the PDU:

1. Route the sub-feed power cable from the RDP to the PDU through the Shielding Troughs.
2. Route each phase conductor (L1, L2, L3) through a current sensor (secured to the PDU enclosure) and secure the current sensor to each conductor using a wire tie (provided).
3. Connect the power cable's individual wires (see the illustration):
 - a. Connect each phase conductor (L1, L2, L3) to the appropriate pole on one of the three-pole breakers (sub-feed breakers) at the bottom of the panel.
 - b. Connect the neutral wire to a termination point on the Neutral Bar (N) at the top of the distribution panel.
 - c. Connect the ground wire to a ground lug (G) at the bottom of the distribution panel.



Route and attach power cables to equipment racks

If you ordered overhead wiring, connect the prewired power cables of the InfraStruXure PDU as follows:

1. Install the Shielding Troughs, Shielding Partitions, and Cable Ladders so that you can route power cables from the PDU to the NetShelter VX Enclosures.



For installation instructions, see page 39.

2. Find the numbers that indicate the enclosure to which each power cable will supply power. These numbers appear on the roof of the PDU where the power cables exit, and on the ends of each power cable.



Note

The enclosures are not numbered. Consult your APC InfraStruXure Configuration Build-out Tool to determine the enclosure associated with each power cable.

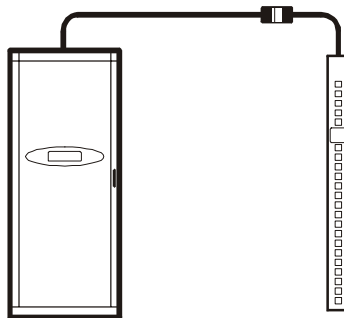
3. Beginning with the power cables for the enclosures farthest from the PDU, run each power cable within the Shielding Trough along the row and, if necessary, across one or more Cable Ladders to the enclosure to which it will provide power.



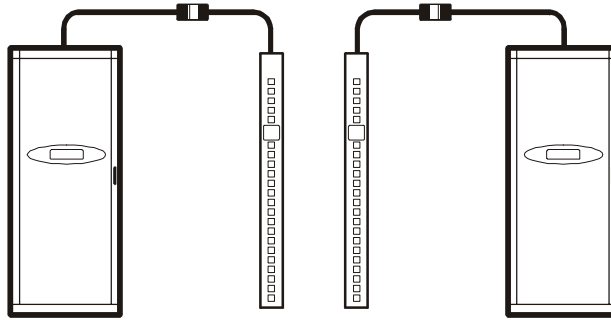
Note

Ensure that the L21-20 twist-lock connector at the end of each power cable always lies on top of any longer power cables in the Shielding Trough.

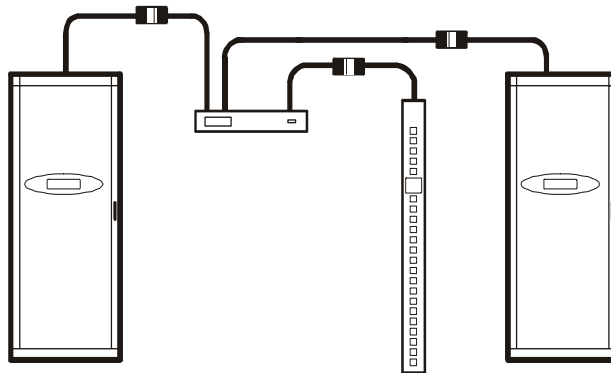
4. Connect the appropriate power cable to APC power management equipment in the enclosure in one of the four following ways:
 - *For single-feed devices without redundancy:* attach a power cable directly to a Rack PDU installed in a NetShelter VX Enclosure.



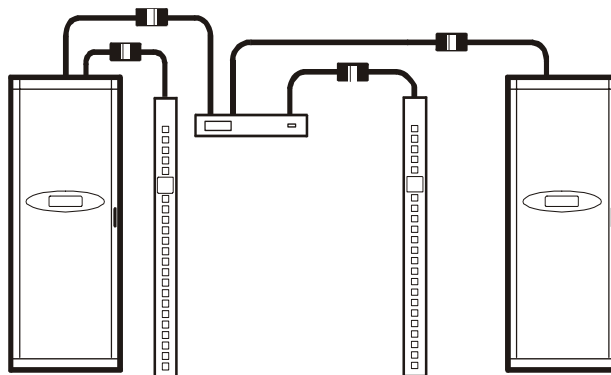
- For dual-feed devices within a redundant system: attach a power cable from each PDU into two different Rack PDUs in the NetShelter VX Enclosure.



- For single-feed devices within a redundant system with an Automatic Transfer Switch: connect a power cable to the Automatic Transfer Switch (A and B feeds) and connect the Automatic Transfer Switch power cord to a Rack PDU in the NetShelter VX Enclosure.

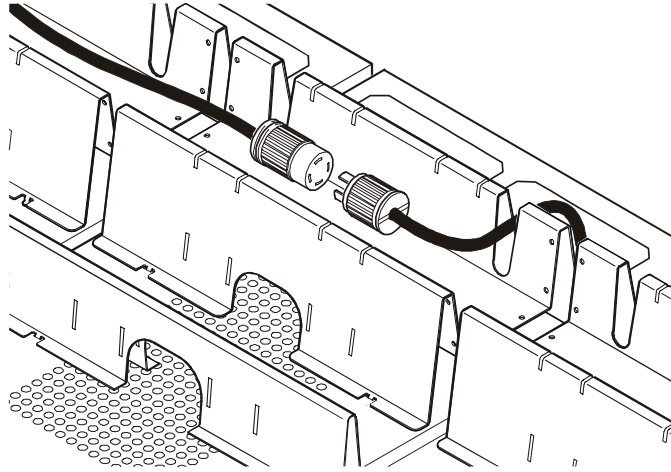


- For dual-feed devices in a redundant system with an Automatic Transfer Switch: connect a power cable from each PDU to the Automatic Transfer Switch's A and B feeds, and another power cable from one PDU to a Rack PDU, and the Automatic Transfer Switch's power cord to a second Rack PDU in the NetShelter VX Enclosure.



Lay the cables neatly in the Shielding Trough to minimize cable build-up.

5. From each NetShelter VX Enclosure, run the power cable of the appropriate APC power management device out the roof of the enclosure, through the notch in the rear side of the Shielding Trough, to the connector of the appropriate power cable from the PDU. Plug the two connectors together, and twist them clockwise to lock.

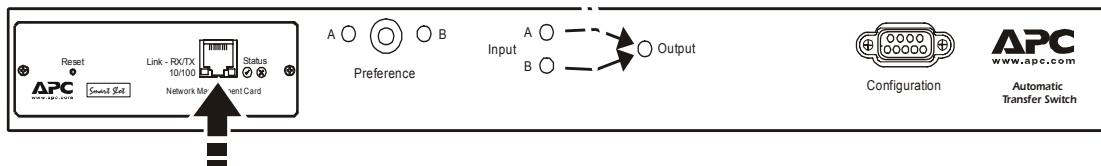


Route Data Cables to the InfraStruXure Manager Hub (or Switch)

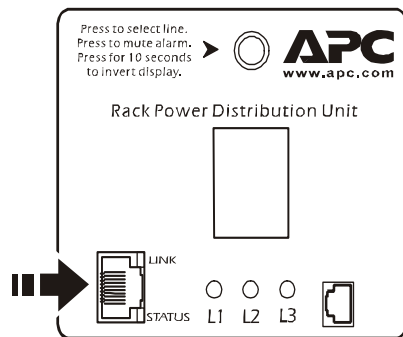
Connect network cables to components

Connect a Cat-5 network cable (provided) to the network or 10Base-T ports on your APC InfraStruXure devices. The following devices need to be connected:

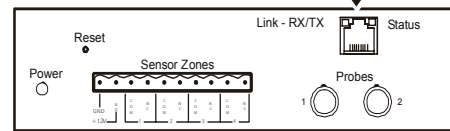
Automatic Transfer Switch



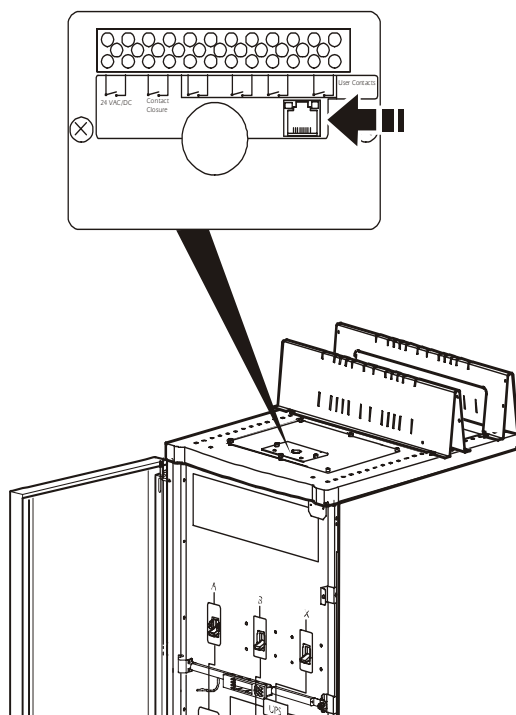
Rack PDU



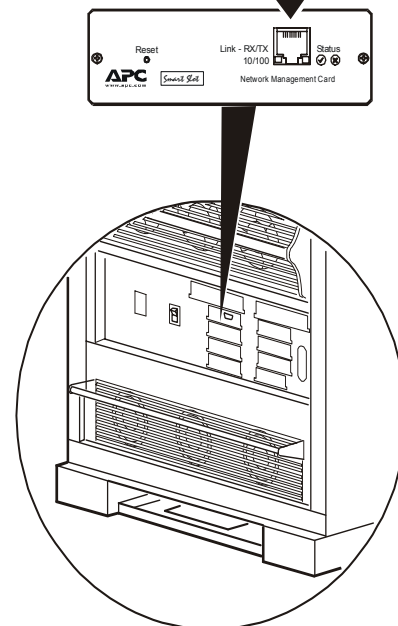
Environmental Monitoring Unit



InfraStruXure PDU



Symmetra PX UPS



Route network cables to the InfraStruXure Manager Hub (or Switch)

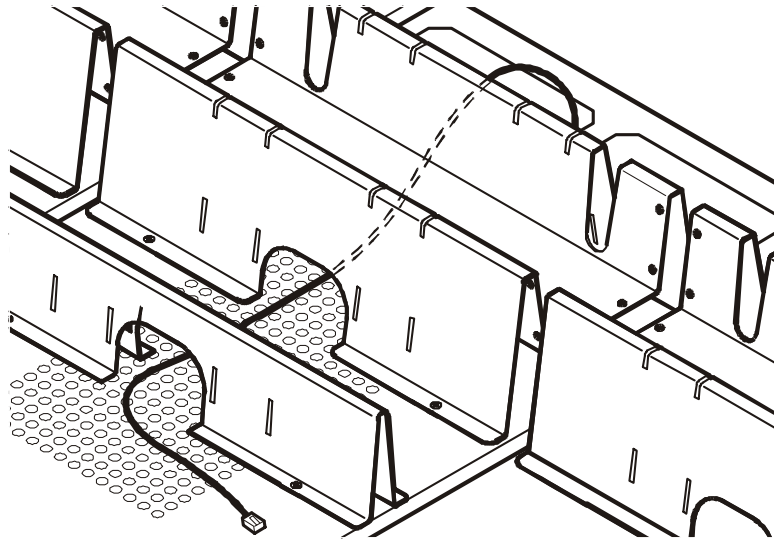
Overhead routing.

1. Install Shielding Partitions and Cable Ladders.



See “Install Shielding Troughs, Shielding Partitions, and Cable Ladders” on page 39.

2. Run the Cat-5 network cables (provided) from each APC device to the InfraStruXure Manager Hub (or Switch).
 - a. Start with the device farthest from the enclosure housing the InfraStruXure Manager and Hub (or Switch), and use the longest supplied Cat-5 cable.
 - b. Bundle cables together and run the bundles in the data cable troughs along rows and across Cable Ladders, if necessary.



3. Connect each APC device's network cable to any available station port in the InfraStruXure Manager Hub (or Switch). Station ports are those with an *x* after the number (e.g., 2x).

Start-Up Procedure

Safety warnings

This section provides instructions on how to perform a system start-up. Do not skip any steps in this procedure.



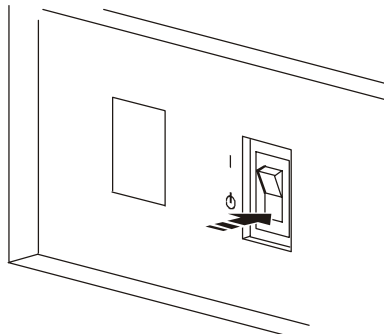
Only APC Field Service Engineers or qualified, APC-trained personnel may perform a system start-up.



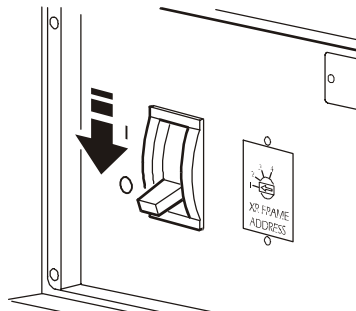
Do not install any batteries into the Battery Enclosure or power modules into the Symmetra PX UPS until instructed to do so.

Ensure that all power is off

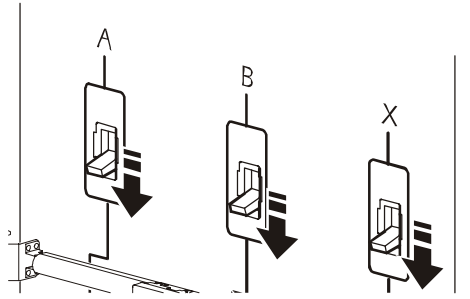
1. Set the UPS **System Enable** switch to OFF.



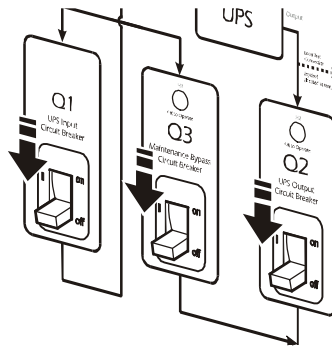
2. Set the Battery Enclosure **DC Disconnect** circuit breaker to OFF.



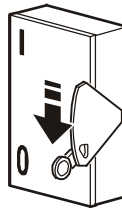
3. Set the **Main Input (A)** and **Bypass Input (B)** switches and the **Cross Tie Output (X)** circuit breaker (if applicable) on the PDU to the OFF position.



4. Open (turn OFF) the **Q1**, **Q2**, and **Q3** circuit breakers on the PDU.

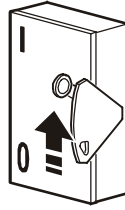


5. Set the upstream main (and bypass, if applicable) utility circuit breaker to OFF.

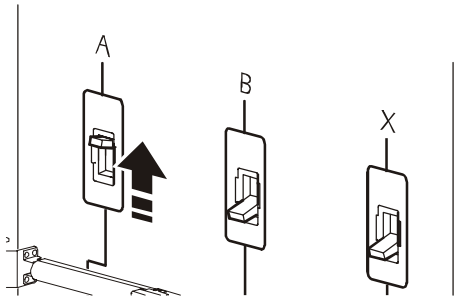


Apply power to the system

1. Set the upstream main (and bypass, if applicable) utility circuit breaker to ON.



2. Ensure A-B-C clockwise phase rotation at the top of the **Main Input (A)** switch on the PDU, using a phase rotation meter.
3. Set the **Main Input (A)** switch on the PDU to ON.



4. Verify A-B-C clockwise phase rotation at the top of the primary winding of the transformer, using a phase rotation meter.
5. Verify that the proper voltage is present on the secondary winding of the transformer (208 V, metered phase-to-phase), using a true RMS voltmeter.
6. Install at least one battery module (four battery units) in the Battery Enclosure.

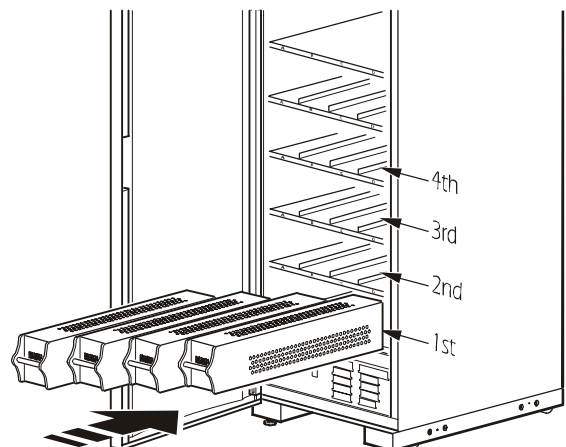
Install battery modules, starting in the lowest available shelf. Position the battery unit between the grooves, and slide it completely into the enclosure.



Use two people to lift and install battery units.



The DC bus in the Battery Enclosure is energized when battery modules are installed, even when the DC Disconnect breaker is open.

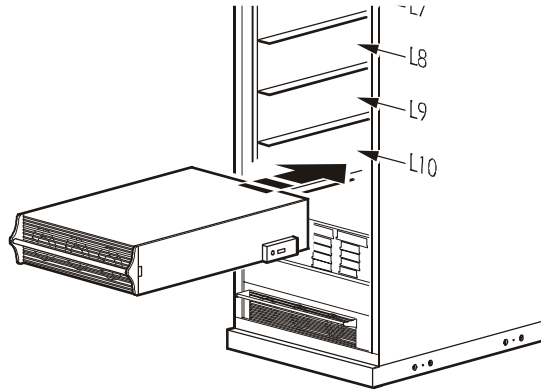


7. Install at least one power module in the Symmetra PX UPS.

Install power modules starting from the lowest available shelf. Push each module completely into the enclosure.

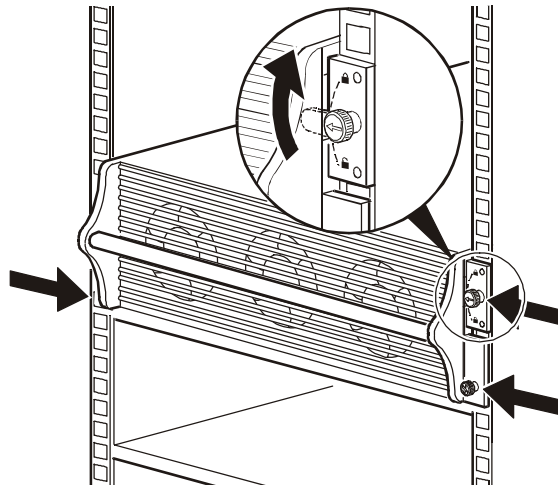


Use two people to lift and install power modules.



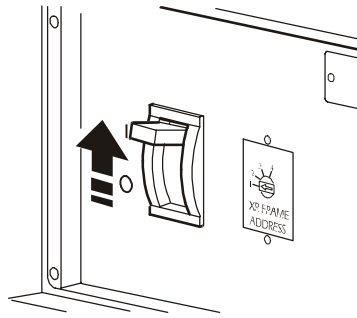
8. Secure the power module:

- a. Tighten the screws on each side of the power module.
- b. Turn the locking latch clockwise until the arrow on the knob faces the power module.

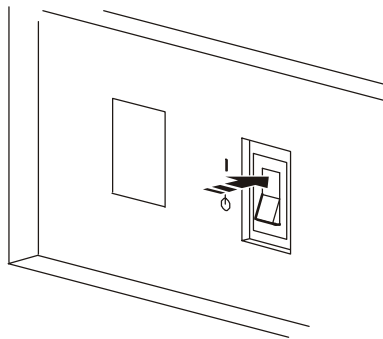


The power module will not start unless the locking latch is engaged.

9. Set the Battery Enclosure **DC Disconnect** circuit breaker to ON.



10. Set the UPS **System Enable** switch to ON.



When the **System Enable** switch is in the ON position, the UPS is running on battery. The Startup screen appears on the display interface of the Symmetra PX UPS, and then

```

PowerView RM
Rev: 000 English
Please wait...
  
```

the top-level status screen appears on the display interface. This may take up to 40 seconds.

```

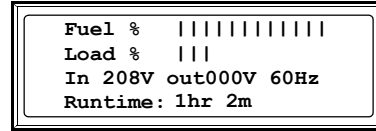
Fuel %  | | | | | | | | | |
Load %  | | |
In 208V out000V 60Hz
Runtime: 1hr 2m
  
```

Verify UPS battery operation

1. Read the messages displayed on the Symmetra PX UPS display interface:

Note any alarms and verify that they are appropriate for start-up conditions.

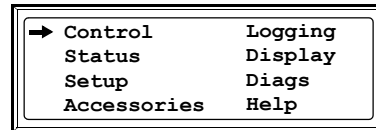
Top-Level Status Screen



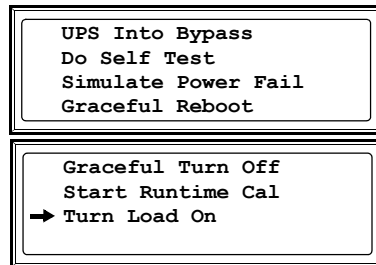
2. Command the UPS to apply power to the load:

- a. Press the ESC key to open the top-level menu.
- b. Select **Control**, and press the ENTER key.
- c. Select **Turn Load On/Off** from the **Control** menu, and press the ENTER key.

Top-Level Menu

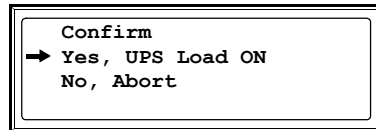


Control Menu

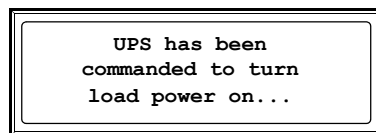


- d. On the next screen: select **Yes, UPS Load ON**, and press the ENTER key.

Confirmation Screen

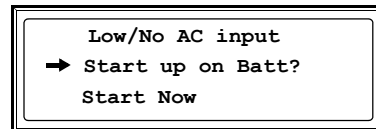


The interface will display the following screen:

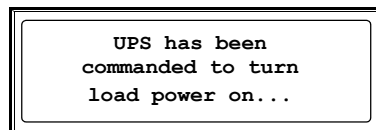


The interface will display the following fault message:

- e. Select **Start up on Batt**, and press the ENTER key.



The interface will display the following screen:



The UPS interface displays the following fault screen:

- f. Press any key.

```

Bypass not available
Input Freq/Volt out of range
Press any key...
  
```

The UPS interface displays the following fault screen:

- g. Press the ESC key.

```

End of Fault List
Press Esc to exit or other
keys to view list again
  
```

The LOAD ON LED illuminates and the interface displays the following screen:

```

UPS load is on

Press any key...
  
```

After you have verified that the UPS operates correctly in on-battery operation, shut-down the UPS:

3. Command the UPS to turn off power to the load:

- a. Press the ESC key at the top-level status screen to open the top-level menu and have access to eight submenus.
- b. Select **Control**, and press the ENTER key.

Top-Level Menu

```

→ Control      Logging
Status         Display
Setup          Diags
Accessories    Help
  
```

- c. Select **Turn Load Off** from the **Control** menu, and press the ENTER key.

Control Menu

```

UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot
  
```

```

Graceful Turn Off
Start Runtime Cal
→ Turn Load Off
  
```

Confirmation Screen

```

Confirm
→ Yes, UPS Load OFF
No, Abort
  
```

- d. On the next screen: select **Yes, UPS Load OFF**, and press the ENTER key.

The LOAD ON LED turns off and the interface displays the following two screens:

```

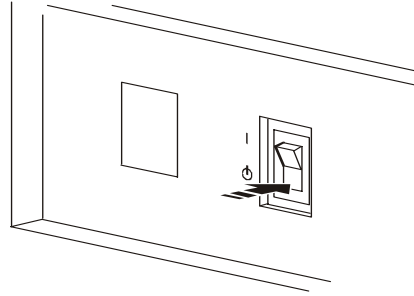
UPS has been
commanded to turn
load power off...
  
```

```

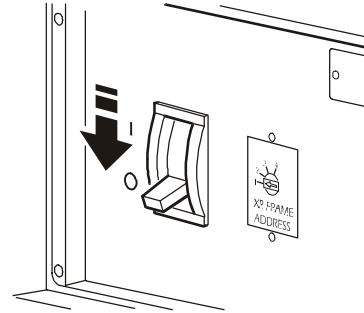
UPS load is off

Press any key...
  
```

4. Set the UPS **System Enable** switch to the OFF position.

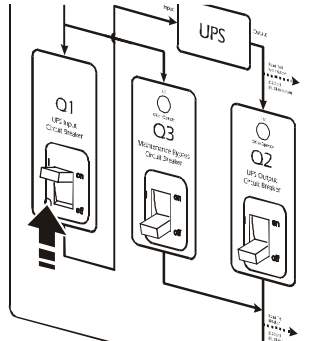


5. Set the Battery Enclosure **DC Disconnect** circuit breaker to the OFF position.



Verify proper voltage and phase rotation on the PDU

1. Close (turn ON) the **Q1** circuit breaker on the InfraStruXure PDU to apply power to the UPS.

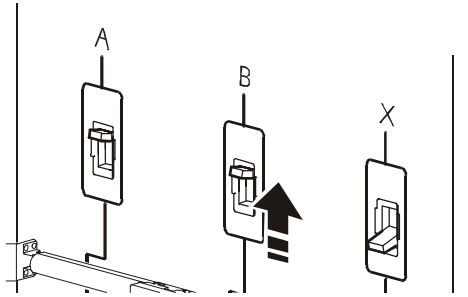


2. Ensure A-B-C clockwise rotation at the UPS input bus bars, using a phase rotation meter.
3. Verify proper voltage is present at the UPS input bus bars (208V, metered phase-to-phase), using a true RMS voltmeter.
4. Ensure A-B-C clockwise rotation at the top of the PDU bypass switch, using a phase rotation meter.
5. Verify proper voltage is present at the top of the PDU bypass switch (208V, metered phase-to-phase), using a true RMS voltmeter.



The voltage for the bypass feed can only be 208V, phase-to-phase.

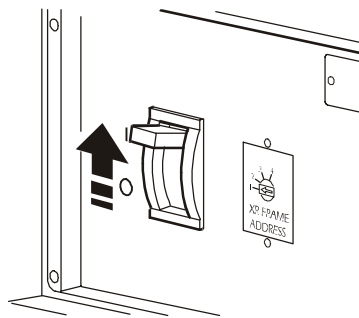
6. Set the PDU **Bypass Input (B)** switch to ON.



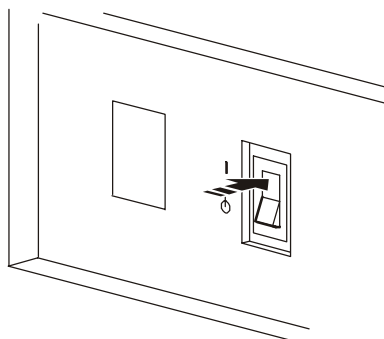
7. Ensure A-B-C clockwise rotation at the UPS Bypass bus bars, using a phase rotation meter.
8. Verify proper voltage is present at the UPS Bypass bus bars (208V, metered phase-to-phase), using a true RMS voltmeter.

Start the UPS

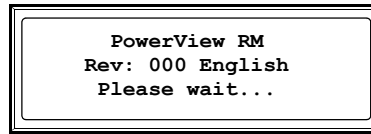
1. Set the Battery Enclosure **DC Disconnect** circuit breaker to ON.



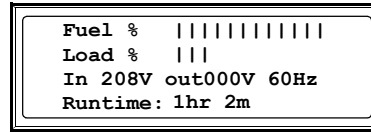
2. Set the UPS **System Enable** switch to ON.



When the **System Enable** switch is in the ON position, the UPS is running on battery. The Startup screen appears on the display interface of the Symmetra PX UPS, and then



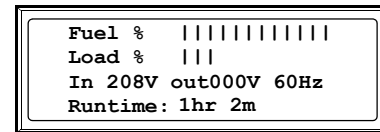
the top-level status screen appears on the display interface. This may take up to 40 seconds.



3. Read the messages displayed on the Symmetra PX UPS display interface:

Note any alarms and verify that they are appropriate for start-up conditions.

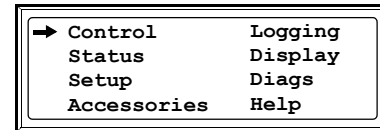
Top-Level Status Screen



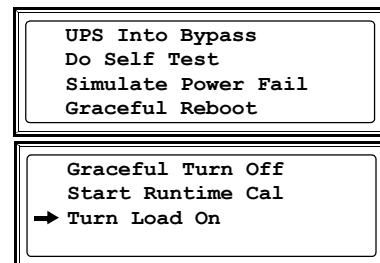
4. Command the UPS to apply power to the load:

- a. Press the ESC key to open the top-level menu.
- b. Select **Control**, and press the ENTER key.
- c. Select **Turn Load On/Off** from the **Control** menu, and press the ENTER key.

Top-Level Menu

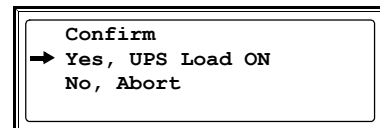


Control Menu

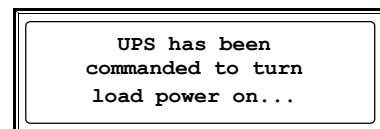


- d. On the next screen: select **Yes, UPS Load ON**, and press the ENTER key.

Confirmation Screen



The interface will display the following screen:



The interface will display the following fault message:

- e. Select **Start up on Batt**, and press the ENTER key.

```

Low/No AC input
➔ Start up on Batt?
Start Now
  
```

The interface will display the following screen:

```

UPS has been
commanded to turn
load power on...
  
```

The UPS interface displays the following fault screen:

- f. Press any key.

```

Bypass not available
Input Freq/Volt out of range
Press any key...
  
```

The UPS interface displays the following fault screen:

- g. Press the ESC key.

```

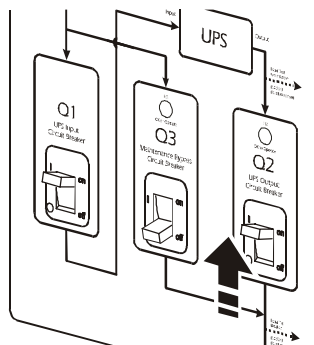
End of Fault List
Press Esc to exit or other
keys to view list again
  
```

The LOAD ON LED illuminates and the interface displays the following screen:

```

UPS load is on
Press any key...
  
```

5. Close (turn ON) the **Q2** circuit breaker on the PDU.



Verify proper phasing: place the UPS into bypass operation

1. Command the UPS into static bypass operation through the UPS display interface:

- a. Press the ESC key to open the top-level menu.
- b. Select **Control** on the top-level menu, and press the ENTER key.

Top-Level Menu

→ Control	Logging
Status	Display
Setup	Diags
Accessories	Help

Control Menu

→ UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot

- c. Select **UPS Into Bypass** on the **Control** menu, and press the ENTER key.

Graceful Turn Off
Start Runtime Cal
Turn Load On

- d. On the next screen: select **Yes, UPS into Bypass**, and press the ENTER key.

Confirmation Screen

Confirm
→ Yes, UPS into Bypass
No, Abort

The BYPASS LED illuminates and the following screens appear:

UPS has been commanded to go into Bypass...

UPS load is in Bypass
Press any key...



Note

The **H3** LED above the **Q3** circuit breaker illuminates, but do not operate the circuit breaker.

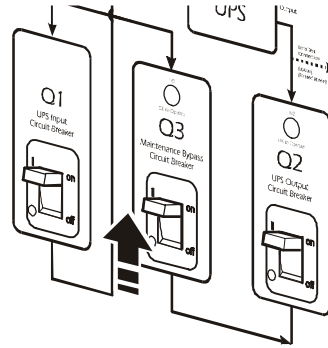
2. Use a true RMS voltmeter to make sure that there is no difference in potential between L1 IN and L1 OUT, L2 IN and L2 OUT, and L3 IN and L3 OUT on the **Q3** circuit breaker. The **Q3** circuit breaker must be in the OFF position. The top side of **Q3** will be utility voltage and the bottom side of **Q3** will be the voltage from the UPS in static bypass. Voltage should be less than 2 volts.



Note

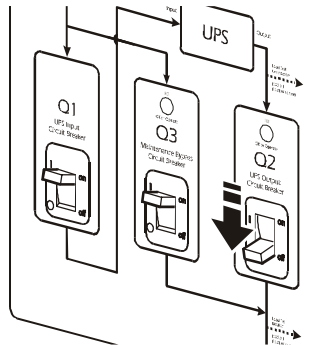
Q3 is a 4-pole circuit breaker. Be sure to measure L1 to L1, L2 to L2, and L3 to L3.

- Close (turn ON) the **Q3** circuit breaker on the InfraStruXure PDU.



The **H2** LED above the **Q2** circuit breaker illuminates, indicating that it is safe to operate the **Q2** circuit breaker.

- Open (turn OFF) the **Q2** circuit breaker on the InfraStruXure PDU.



The UPS will display a Forced Bypass message on the display interface and the Fault LED will be red.

Return from maintenance bypass operation

1. Command the UPS into static bypass operation through the UPS display interface:

- a. Press the ESC key to open the top-level menu.
- b. Select **Control** on the top-level menu, and press the ENTER key.

Top-Level Menu

→ Control	Logging
Status	Display
Setup	Diags
Accessories	Help

Control Menu

→ UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot

- c. Select **UPS Into Bypass** on the **Control** menu, and press the ENTER key.

Graceful Turn Off
Start Runtime Cal
Turn Load On

- d. On the next screen: select **Yes, UPS into Bypass**, and press the ENTER key.

Confirmation Screen

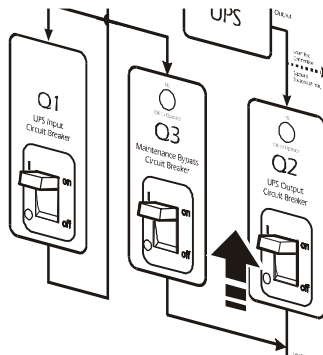
Confirm
→ Yes, UPS into Bypass
No, Abort



Note

The **H2** LED above the **Q2** circuit breaker illuminates, indicating that it is safe to operate the **Q2** circuit breaker.

2. Close (turn ON) the **Q2** circuit breaker on the InfraStruXure PDU.

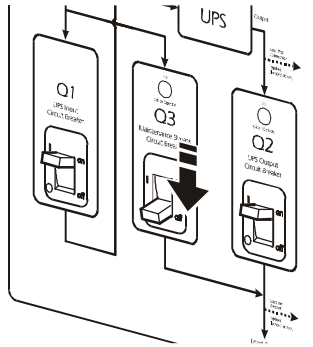


Note

The **H3** LED above the **Q3** circuit breaker illuminates, indicating that it is safe to operate the **Q3** circuit breaker.

3. Open (turn OFF) the **Q3** circuit breaker on the InfraStruXure PDU.

The UPS automatically returns from Static Bypass.

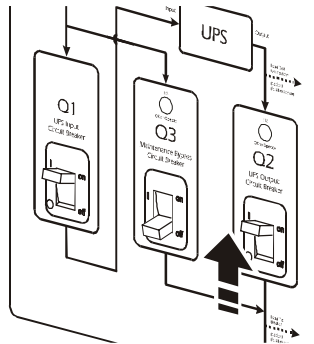


Power the PDU Distribution Circuit Breakers

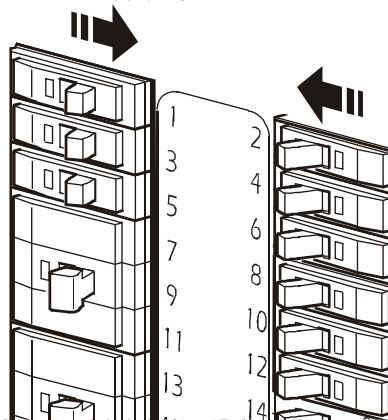
1. Ensure that the **Q2** circuit breaker on the PDU is closed (ON).



When **Q2** is closed, the PDU distribution panel is energized.



2. Close (turn ON) the PDU **distribution panel** circuit breakers.



When the distribution panel circuit breakers are closed, the PDU power cables and connected equipment are energized.

Close Cross-Tie

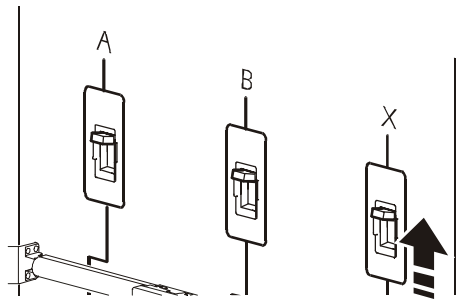
1. If applicable, ensure A-B-C clockwise rotation at the bottom of the PDU cross tie output circuit breaker, using a phase rotation meter.
- 2 . If applicable, verify that there is NO voltage present across the PDU cross tie circuit breaker, and that proper voltage is present on each side of the circuit breaker (208 V, metered phase-to-phase), using a true RMS voltmeter.



Warning

There should be no voltage present across the Cross Tie Output circuit breaker.

- 3 . If applicable, set the PDU **Cross-Tie Output (X)** circuit breaker to ON.



Once the cross-tie output circuit breaker is closed, you can start the system to which the circuit breaker is tied. Repeat this start-up procedure for each InfraStruXure system.

Configure the InfraStruXure Manager

Once all equipment is installed, the network cables are connected to the InfraStruXure Manager hub (or switch), and start-up of the system is complete, configure the InfraStruXure Manager.



See also

For instructions, see the *InfraStruXure Manager Installation and Quick-Start* manual included with your InfraStruXure Manager.



Note

If you use PowerChute Network Shutdown (PCNS) software with your InfraStruXure UPS, your UPS must have a connection to the “User LAN” (public network) for PCNS to function correctly. If the Network Management Card installed in your UPS is connected to the InfraStruXure Manager’s “APC LAN,” you must install a second Network Management Card in your UPS and connect it to the “User LAN” (public network) to use PCNS.

Appendix A : System Operation

How to Transfer the UPS into Maintenance Bypass Operation



Note

Select **Help** from the top-level menu screen of the PDU display interface and select the first help topic, **Putting the PDU into Maintenance Bypass**, or follow the procedure below.

When servicing the UPS, transfer the UPS into maintenance bypass operation. When the UPS is operating in maintenance bypass, input power flows directly to the PDU and out to the load equipment.

1. Command the UPS into static bypass operation through the UPS display interface:

- a. Press the ESC key at the top-level status screen to open the top-level menu.
- b. Select **Control** on the top-level menu, and press the ENTER key.

Top-Level Menu

→ Control	Logging
Status	Display
Setup	Diags
Accessories	Help

- c. Select **UPS Into Bypass** on the **Control** menu and, press the ENTER key.

Control Menu

→ UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot

Graceful Turn Off
Start Runtime Cal
Turn Load On

- d. Confirm the selection on the next screen: select **Yes, UPS into Bypass** and press the ENTER key.

Confirmation Screen

Confirm
→ Yes, UPS into Bypass
No, Abort

The UPS BYPASS LED illuminates and the following screens appear:

UPS has been commanded to go into Bypass...

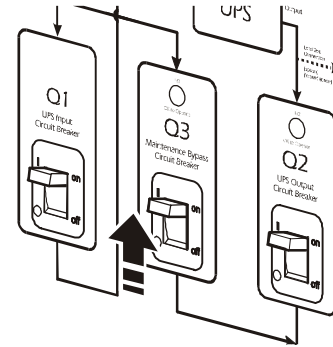
UPS load is in Bypass
Press any key...



The **H3** LED above the **Q3** circuit breaker illuminates, indicating that it is safe to operate the **Q3** circuit breaker.

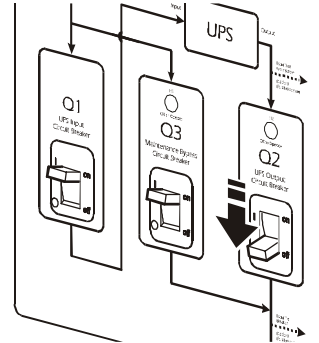
2. Close (turn ON) the **Q3** circuit breaker on the PDU.

If you have a dual-fed system, check to ensure that power is available before operating the **Q3** circuit breaker.

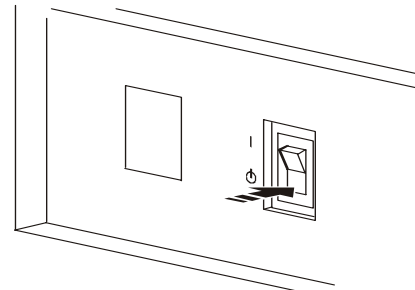


The **H2** LED above the **Q2** circuit breaker illuminates, indicating that it is safe to operate the **Q2** circuit breaker.

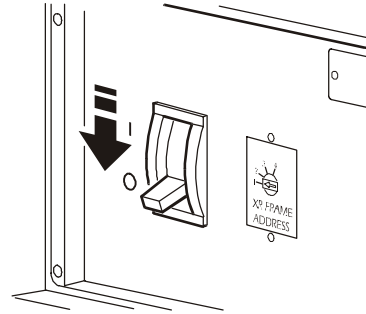
3. Open (turn OFF) the **Q2** circuit breaker on the PDU.



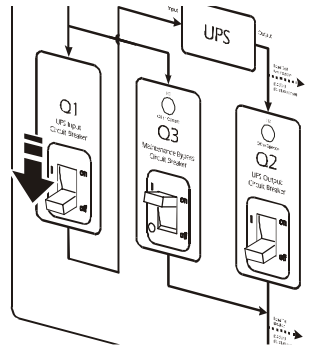
4. Set the UPS **System Enable** switch to the OFF position.



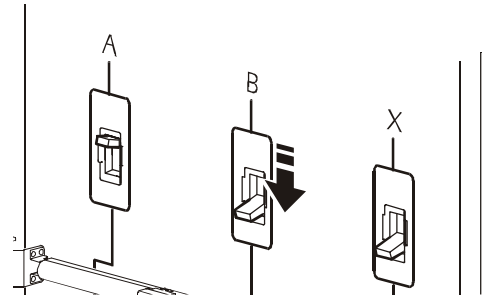
5. Set the Battery Enclosure **DC Disconnect** circuit breaker to the OFF position.



6. Open (turn OFF) the **Q1** circuit breaker on the PDU.



7. If applicable, set the PDU Q10 **Bypass Input (B)** switch to OFF.



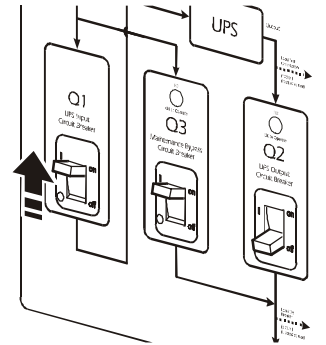
The UPS is now in maintenance bypass operation.

How to Return from Maintenance Bypass Operation

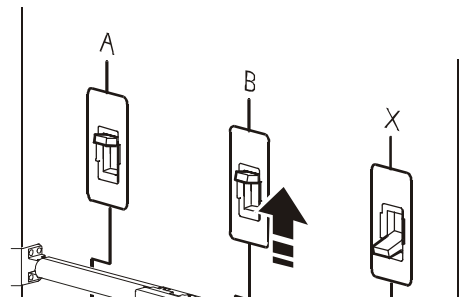


Select **Help** from the top-level menu screen on the PDU display interface and select the second help topic, **Returning from PDU Maintenance Bypass**, or follow the procedure below:

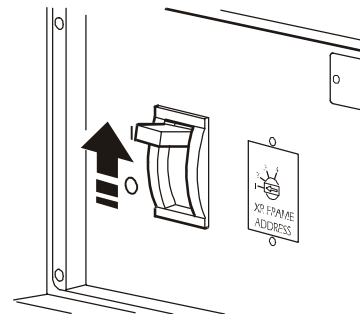
1. Close (turn ON) the **Q1** circuit breaker on the PDU.



2. If applicable, set the PDU Q10 **Bypass Input (B)** switch to ON.

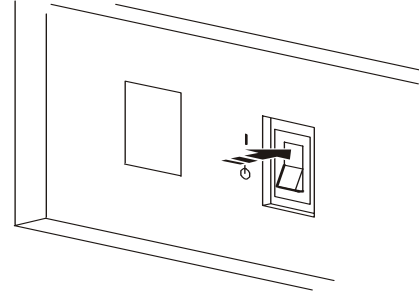


3. Set the XR Battery Enclosure **DC Disconnect** circuit breaker to ON.



4. Set the UPS **System Enable** switch to the ON position.

The UPS will show a **Forced Bypass** message on the display interface, and the Fault LED will be red.



5. Command the UPS to apply power to the load:

- a. Press the ESC key at the top-level status screen to open the top-level menu and have access to eight submenus.
- b. Select **Control**, and press the ENTER key.

Top-Level Menu

➔ Control	Logging
Status	Display
Setup	Diags
Accessories	Help

- c. Select **Turn Load On** from the **Control** menu, and press the ENTER key.

Control Menu

UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot

Graceful Turn Off
Start Runtime Cal
➔ Turn Load On

- d. On the next screen: select **Yes**, **UPS Load ON**, and press the ENTER key.

Confirmation Screen

Confirm
➔ Yes, UPS Load ON
No, Abort

The LOAD ON LED illuminates and the interface displays the following two screens:

UPS has been commanded to turn load power on...

UPS load is on Press any key...
--

6. Command the UPS into static bypass operation through the UPS display interface:

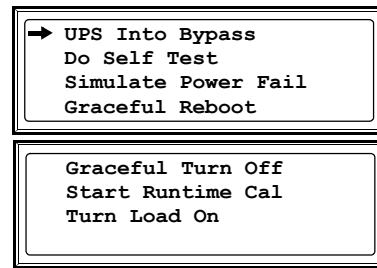
- a. Press the ESC key at the top-level status screen to open the top-level menu.
- b. Select **Control** on the top-level menu, and press the ENTER key.

Top-Level Menu

➔ Control	Logging
Status	Display
Setup	Diags
Accessories	Help

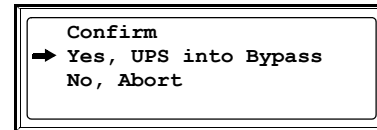
- c. Select **UPS Into Bypass** on the **Control** menu, and press the ENTER key.

Control Menu



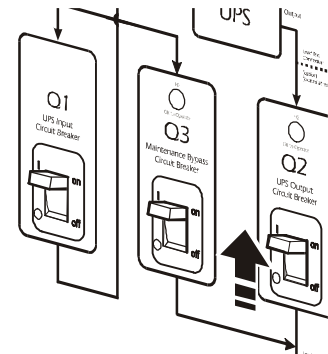
- d. Confirm the selection on the next screen: select **Yes**, **UPS into Bypass**, and press the ENTER key.

Confirmation Screen



The **H2** LED above the **Q2** circuit breaker illuminates, indicating that it is safe to operate the **Q2** circuit breaker.

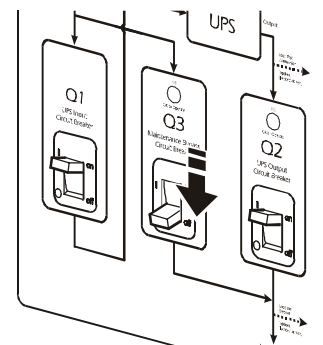
7. Close (turn ON) the **Q2** circuit breaker on the PDU.



The **H3** LED above the **Q3** circuit breaker illuminates, indicating that it is safe to operate the **Q3** circuit breaker

8. Open (turn OFF) the **Q3** circuit breaker on the PDU.

The UPS automatically comes out of Static Bypass operation.



How to Ensure Total Power Off

1. Command the UPS to turn off power to the load:

a. Press the ESC key at the top-level status screen to open the top-level menu and have access to eight submenus.

Top-Level Menu

→ Control	Logging
Status	Display
Setup	Diags
Accessories	Help

b. Select **Control**, and press the ENTER key.

Control Menu

UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot

c. Select **Turn Load Off** from the **Control** menu, and press the ENTER key.

Graceful Turn Off
Start Runtime Cal
→ Turn Load Off

Confirmation Screen

Confirm
→ Yes, UPS Load OFF
No, Abort

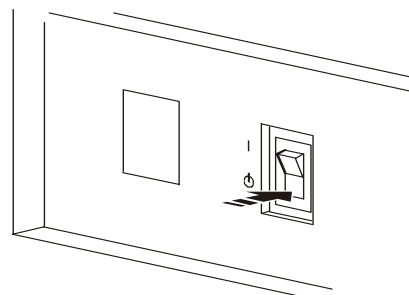
d. On the next screen: select **Yes, UPS Load OFF**, and press the ENTER key.

The LOAD ON LED turns off and the interface displays the following two screens:

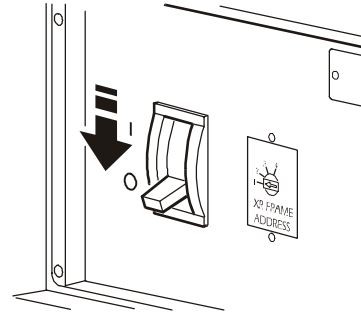
UPS has been commanded to turn load power off...
--

UPS load is off Press any key...

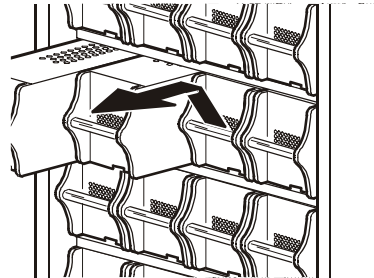
2. Set the UPS **System Enable** switch to the OFF position.



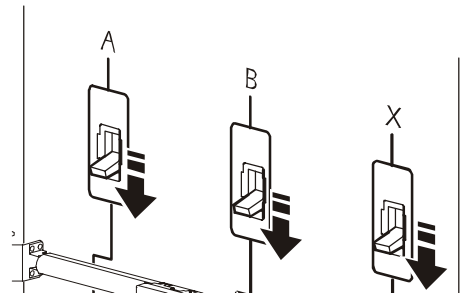
3. Set the Battery Enclosure **DC Disconnect** circuit breaker to the OFF position.



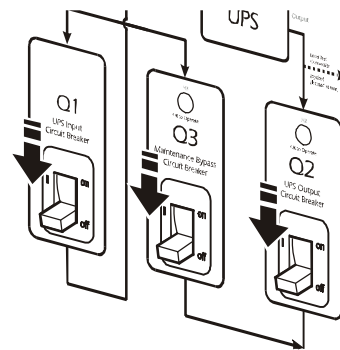
4. Pull out all battery units in the Battery Enclosures to the red battery disconnect line.



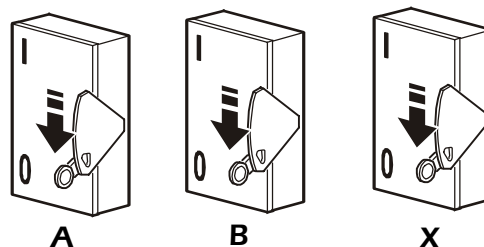
5. Set the **Main Input** switch (A), and, if applicable, the **Q10 Bypass Input** switch (B), and **Cross Tie Output** circuit breaker (X) on the PDU to the OFF position.



6. Open (turn OFF) the **Q1**, **Q2**, and **Q3** circuit breakers on the PDU.



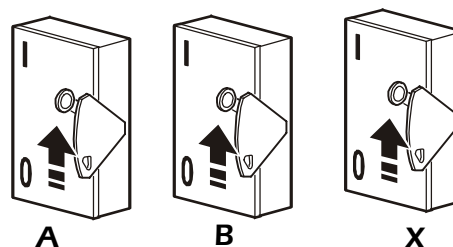
7. Set the upstream main input, and, if applicable, the bypass input and cross tie utility circuit breaker to the OFF or Locked Out position.



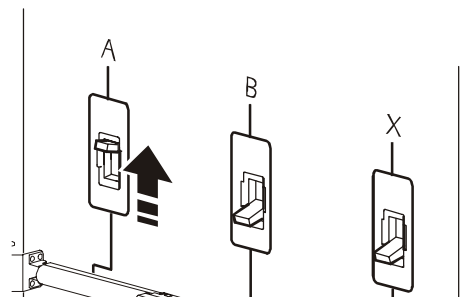
How to Apply Power to the System

This procedure instructs on how to apply power to a system that has already been installed. For initial start-up instructions, see *InfraStruXure 80kW Installation and Start-Up*.

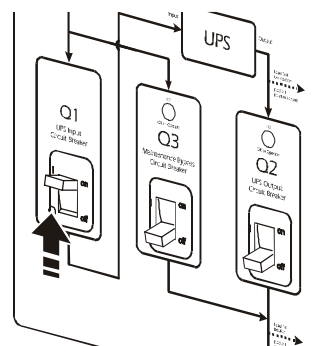
1. Set the upstream utility, and, if applicable, the bypass input and cross tie utility circuit breaker to ON.



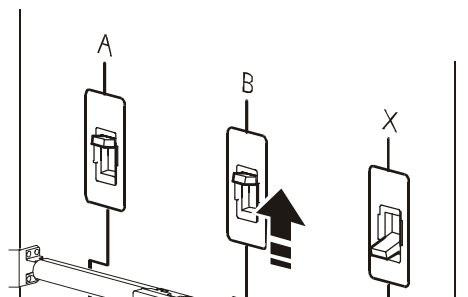
1. Set the **Main Input (A)** switch on the PDU to ON.



2. Close (turn ON) the **Q1** circuit breaker on the PDU to apply power to the UPS.

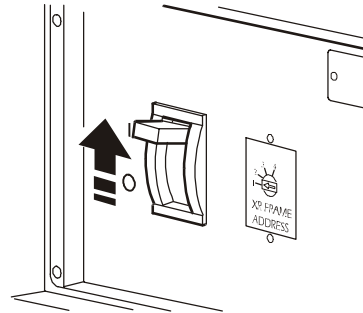


3. If applicable, set the Q10 **Bypass Input (B)** switch on the PDU to ON.

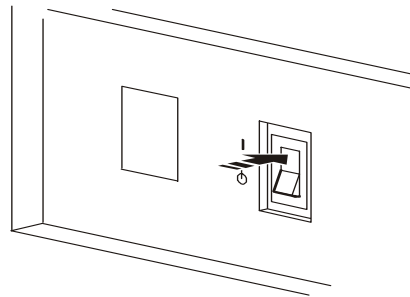


4. Ensure that all battery units are pushed all the way into the Battery Enclosures and locked into position.

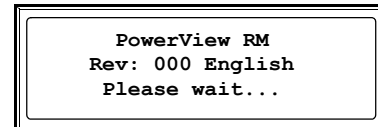
5. Set the Battery Enclosure **DC Disconnect** circuit breaker to ON.



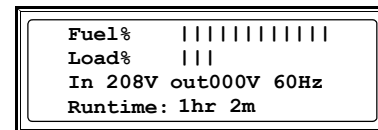
6. Set the UPS **System Enable** switch to ON



When the **System Enable** switch is placed in the ON position, the Startup screen appears on the display interface of the Symmetra PX UPS.



The top-level status screen appears on the display interface. This may take up to 30 seconds.



7. Read the messages displayed on the UPS display interface:

- a. Note any alarms, and verify that they are appropriate for start-up conditions.
- b. Verify that the UPS accepts the input.

Top-Level Status Screen

```

Fuel%      | | | | | | | | | |
Load%      | | |
In 208V out000V 60Hz
Runtime: 1hr 2m
  
```

8. Command the UPS to apply power to the load:

- a. Press the ESC key at the top-level status screen to open the top-level menu and have access to eight submenus.
- b. Select **Control**, and press the ENTER key.

Top-Level Menu

```

➔ Control      Logging
Status         Display
Setup          Diags
Accessories    Help
  
```

- c. Select **Turn Load On** from the **Control** menu, and press the ENTER key.

Control Menu

```

UPS Into Bypass
Do Self Test
Simulate Power Fail
Graceful Reboot
  
```

```

Graceful Turn Off
Start Runtime Cal
➔ Turn Load On
  
```

- d. On the next screen: select **Yes, UPS Load ON**, and press the ENTER key.

Confirmation Screen

```

Confirm
➔ Yes, UPS Load ON
No, Abort
  
```

The LOAD ON LED illuminates, and the interface displays the following two screens:

```

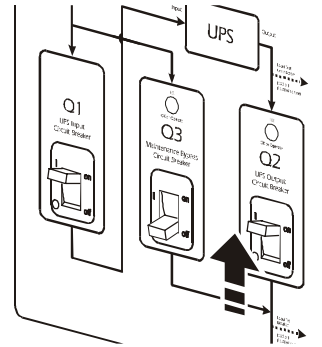
      UPS has been
      commanded to turn
      load power on...
  
```

```

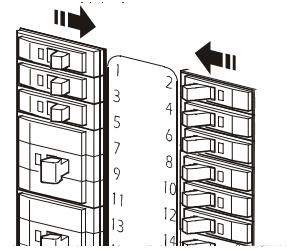
      UPS load is on

      Press any key...
  
```

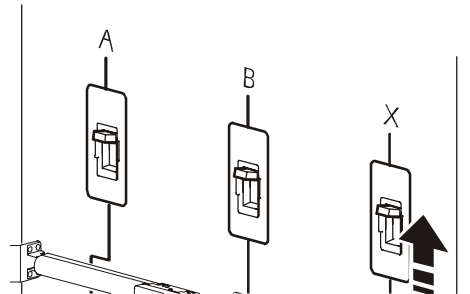
- 9 . To apply power to the PDU distribution panel, close (turn ON) the **Q2** circuit breaker on the PDU.



10. To apply power to the PDU power cords and connected equipment, close (turn ON) the distribution panel circuit breakers.

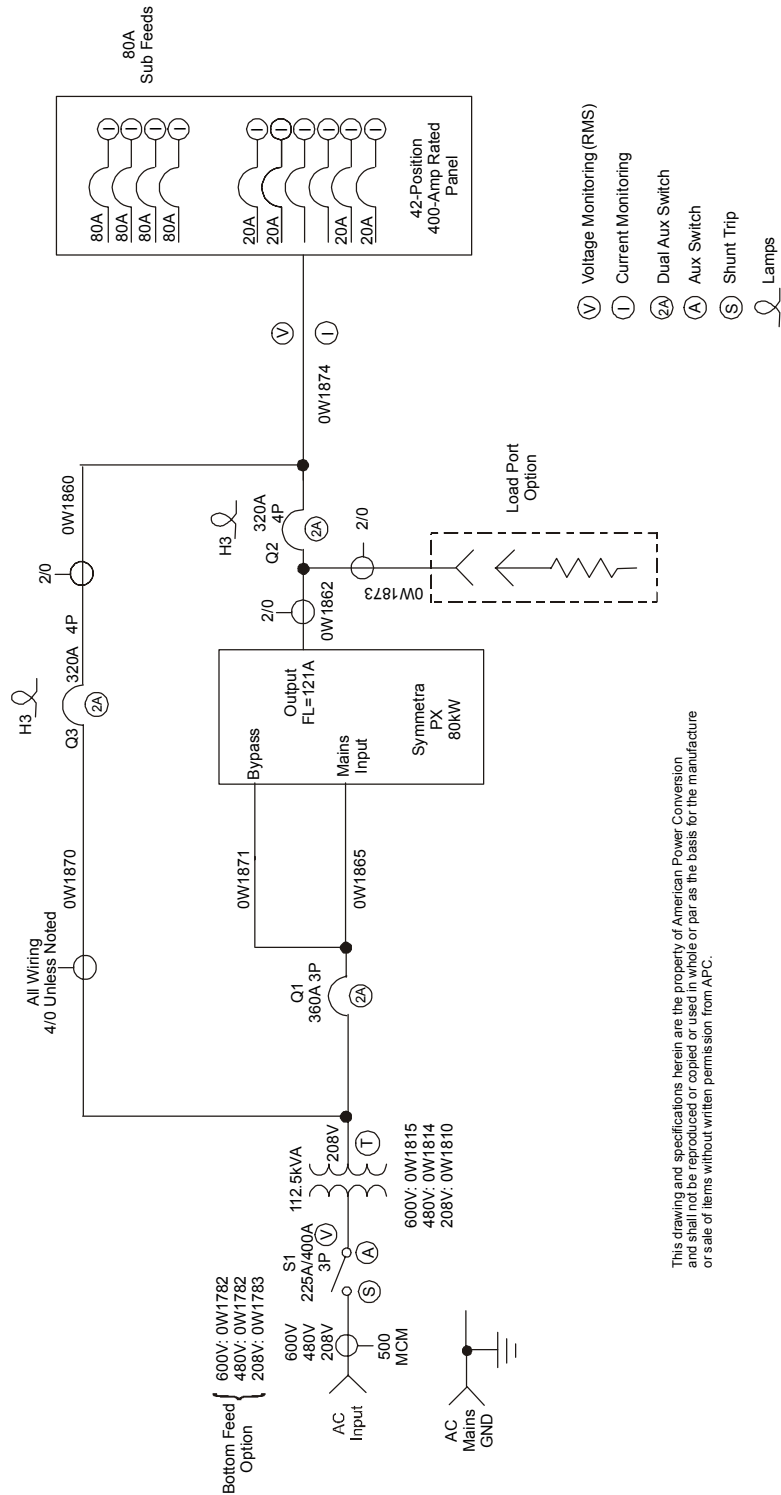


11. If applicable, close (turn ON) the **Cross Tie Output (X)** circuit breaker.



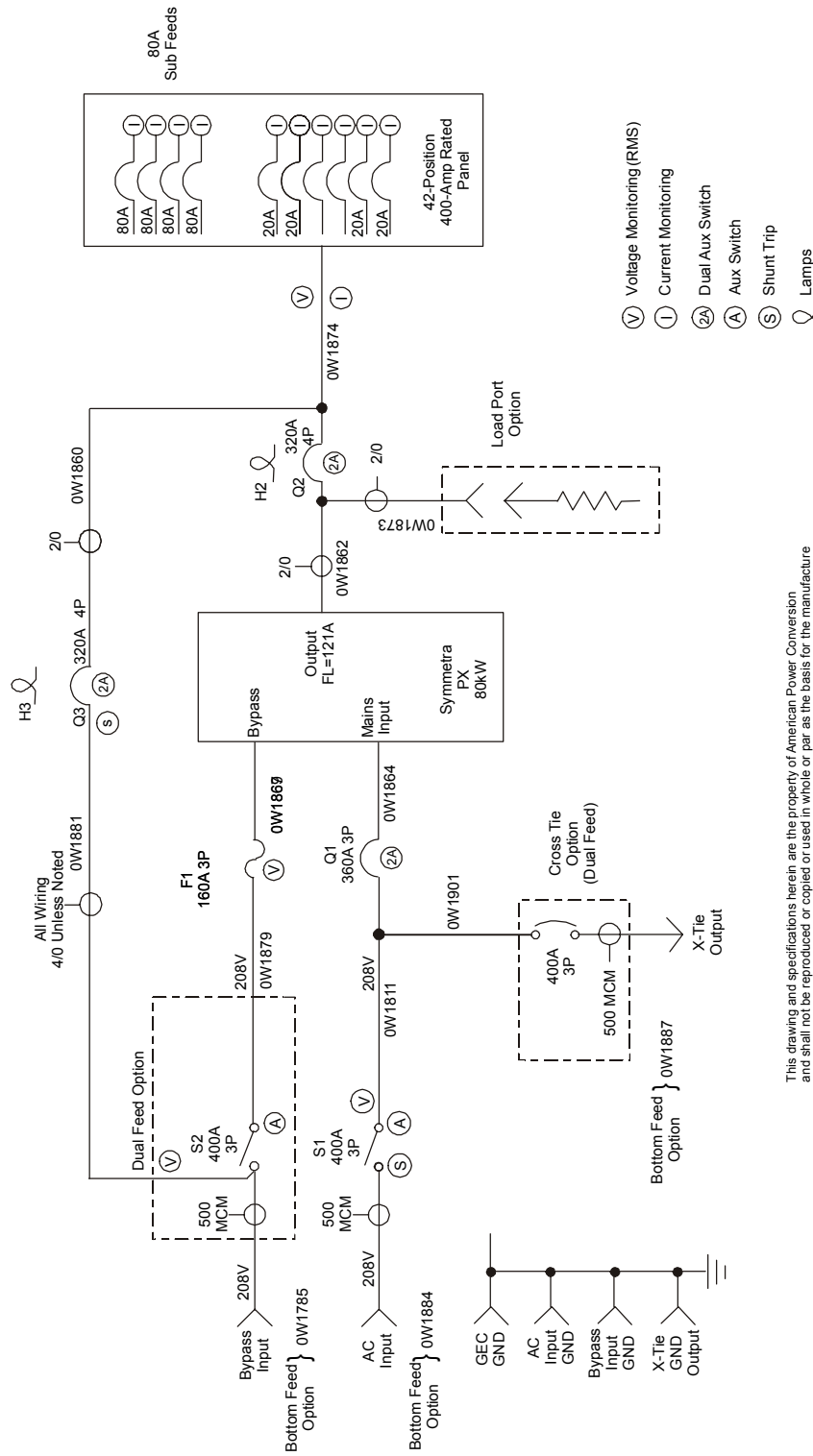
Appendix B : Single-Line Diagrams

80kW PDU with System Bypass 208V, 480V, or 600V Input, Single-feed, with Transformer

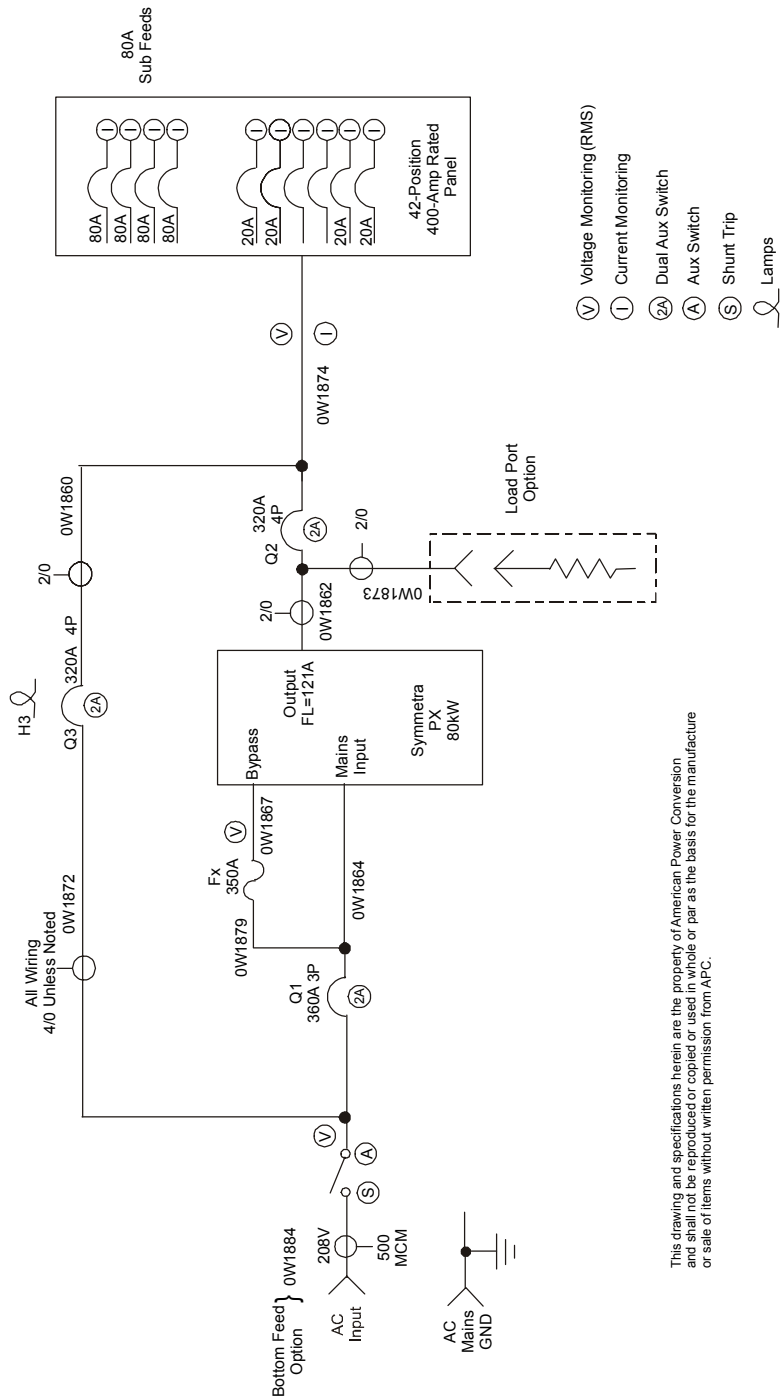


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80kW PDU with System Bypass 208V Input, Dual-feed, with Cross Tie Output Breaker, without a Transformer



80kW PDU with System Bypass 208V Input, Single-feed, without a Transformer



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Appendix C: Changes in This Manual

Overview

The following list documents the specific changes made to this manual since its last release (990-1467A).

General changes

An index was added to the end of this manual. See pages 85–87.

Changes by page number

Pages 33–36	Updated instructions on how to connect an Emergency Power Off (EPO) switch to the user connection plate.
Pages 37–38	Updated instructions on how to connect user contacts and added information about connecting relay outputs.

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